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AUTHOR Hall, Eugene J.; Turner, Raymond C.
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ABSTRACT

The general purpose of the occupational analysis is to provide workable, basic information dealing with the many and varied duties performed in the industrial mechanics occupation. A review of the contents will provide a guide for designing and organizing a curriculum for teaching skills and knowledge essential to an industrial mechanic. The document opens with a brief introduction followed by a job description. The bulk of the document is presented in table form. Twenty-two duties are broken down into a number of tasks and for each task a two-page table is presented, showing on the first page: tools, equipment, materials, objects acted upon; performance knowledge (related also to decisions, cues and errors), safety--hazard; and on the second page: science; math--number systems; and communications (performance modes, examples, and skills and concepts). The duties involve installation, repair, and maintenance of machinery and equipment used in the production, transportation, and storage of all types of industrial materials. The document concludes with an outline of an industrial mechanics responsibilities and frequency of some preventative maintenance procedures, and a list of personal tools needed by employees. (BP)

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Occupational Analysis

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Instructional Materials Laboratory
Trade and Industrial Education
The Ohio State University
5213

AN ANALYSIS OF THE INDUSTRIAL MECHANICS OCCUPATION

Developed By

Eugene J. Hall
Instructor, Combination Welding
Paul C. Hayes Technical School
Grove City, Ohio

Raymond C. Turner
Consultant
Retired Industrial Mechanic
North American Rockwell
Columbus, Ohio

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Director: Tom L. Hindes
Coordinator: William L. Ashley

The Instructional Materials Laboratory
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The Ohio State University

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TABLE OF CONTENTS

Foreword v

Preface vii

Acknowledgment ix

Job Description xi

Duties

A Inspecting, Repairing, and Maintaining Chain Drive 1
B Inspecting, Repairing, and Maintaining Direct Drive 9
C Inspecting, Repairing, and Maintaining Flat Belt 17
D Inspecting, Repairing, and Maintaining Gear Drive. 25
E Inspecting, Repairing, and Maintaining Gear Box Drive 33
F Inspecting, Repairing, and Maintaining Rack and Pinion Drive 41
G Inspecting, Repairing, and Maintaining Ring and Pinion Drive 49
H Inspecting, Repairing, and Maintaining Variable Speed Drive 57
I Inspecting, Repairing, and Maintaining Vee Belt Drive 65
J Inspecting, Repairing, and Maintaining Centrifugal Clutch 73
K Inspecting, Repairing, and Maintaining Pneumatic Clutch and Brake 81
L Inspecting, Repairing, and Maintaining Acme Feed Screw 89
M Inspecting, Repairing, and Maintaining Ball Nut Feed Screw 97
N Inspecting, Repairing, and Maintaining Fluid Feed Screw. 105
O Inspecting, Repairing, and Maintaining Anti Friction Bearings. 113
P Inspecting, Repairing, and Maintaining Control Systems 121
Q Inspecting, Repairing, and Maintaining Hydraulic, Pneumatic, and Vacuum Components and Systems 129
R Inspecting, Repairing, and Maintaining Installation Machinery. 137
S Inspecting, Repairing, and Maintaining Service Bearings. 141
T Inspecting, Repairing, and Maintaining Weld Shaft Padding 145
U Inspecting, Repairing, and Maintaining Harden Solder. 149
V Inspecting, Repairing, and Maintaining Bending Pipe 155

Index 1 159

Index 2. 161

Index 3. 163

FOREWORD

The occupational analysis project was conducted by The Instructional Materials Laboratory, Trade and Industrial Education, The Ohio State University in conjunction with the State Department of Education, Division of Vocational Education pursuant to a grant from the U.S. Office of Education.

The Occupational Analysis project was proposed and conducted to train vocational educators in the techniques of making a comprehensive occupational analysis. Instructors were selected from Agriculture, Business, Distributive, Home Economics and Trade and Industrial Education to gain experience in developing analysis documents for sixty-one different occupations. Representatives from Business, Industry, Medicine, and Education were involved with the vocational instructors in conducting the analysis process.

The project was conducted in three phases. Phase one involved the planning and development of the project strategies. The analysis process was based on sound principles of learning and behavior. Phase two was the identification, selection and orientation of all participants. The training and workshop sessions constituted the third phase. Two-week workshops were held during which teams of vocational instructors conducted an analysis of the occupations in which they had employment experience. The instructors were assisted by both occupational consultants and subject matter specialists.

The project resulted in producing one hundred two trained vocational instructors capable of conducting and assisting in a comprehensive analysis of various occupations. Occupational analysis data were generated for sixty-one occupations. The analysis included a statement of the various tasks performed in each occupation. For each task the following items were identified: tools and equipment; procedural knowledge; safety knowledge; concepts and skills of mathematics, science and communication needed for successful performance in the occupation. The analysis data provided a basis for generating instructional materials, course outlines, student performance objectives, criterion measures as well as identifying specific supporting skills and knowledge in the academic subject areas.

PREFACE

The scope of the following analysis was designed to cover the work activities of installation, repair, and maintenance of various types of industrial equipment and machinery. The information reported for each task follows a generalized procedure for performing that type of work activity involved. A review of the contents will provide a guide for designing and organizing a curriculum for teaching the skills and knowledge essential to an industrial mechanic.

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The Ohio State University
Columbus, Ohio

Jodi Beittel, Communications
Columbus, Ohio

Diana L. Buckeye, Mathematics
University of Michigan
Avon Lake, Ohio

Rick Fien, Chemistry
The Ohio State University
Beachwood, Ohio

N.S. Gidwani, Chemistry
Columbus Technical Institute
Columbus, Ohio

Bruce A. Hull, Biology
The Ohio State University
Columbus, Ohio

Donald L. Hyatt, Physics
Worthington High School
Worthington, Ohio

Glenn Mann, Communications
Columbus, Ohio

Jerry McDonald, Physical Sciences
Columbus Technical Institute
Reynoldsburg, Ohio

Colleen Osinski, Psychology
Columbus Technical Institute
Columbus, Ohio

David Porteous, Communications
University of Connecticut
Colchester, Connecticut

James A. Sherlock, Communications
Columbus Technical Institute
Columbus, Ohio

Jim VanArsdall, Mathematics
Worthington High School
Worthington, Ohio

Lillian Yontz, Biology
The Ohio State University
Caldwell, Ohio

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Faith Justice	Research Associate
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Rita Buccilla	Typist
Peg Bushelman	Typist
Carol Fausnaugh	Typist
Mindy Fausnaugh	Typist
Rita Hastings	Typist
Carol Hicks	Typist
Sue Holsinger	Typist
Barbara Hughes	Typist
Carol Marvin	Typist
Patti Nye	Typist
Kathy Roediger	Typist
Mary Salay	Typist

JOB DESCRIPTION

An Industrial Mechanic is a skilled worker involved in the installation, repair, and maintenance of machinery and equipment used in the production, transportation, and storage of all types of industrial materials. The industrial mechanic follows manufacturers' specifications and instructions and performs to exact standards.

Duty A Inspecting, Repairing, and Maintaining Chain Drive

1 Inspect chain drive
2 Repair chain drive
3 Maintain chain drive

(TASK STATEMENT) INSPECT CHAIN DRIVE

TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON	PERFORMANCE KNOWLEDGE	SAFETY – HAZARD
Flashlight Socket head wrenches Wiping cloth	Remove inspection plate Operate hand crank Observe chain **Observe sprocket teeth** Hand check chain tension Hand crank and feel operatior Listen for unusual soimds	Safety glasses
DECISIONS	**CUES**	**ERRORS**
Determine repairs needed	Condition at chain drive Unusual sounds	Machine failure under load

12

(TASK STATEMENT) INSPECT CHAIN DRIVE

SCIENCE	MATH – NUMBER SYSTEMS
Simple machines used to gain mechanical advantage [sprocket] Work input, work output, friction and efficiency in simple machines (work output) [Effects of lubrication] Fluids under pressure [pressures, correct lubrication] Inertia and momentum	Operating dimensions

COMMUNICATIONS

PERFORMANCE MODES	EXAMPLES	SKILLS/CONCEPTS
Reading	Inspection order	Comprehension, detail/inference, trade terminology
Speaking	Instruction to operator	Trade terminology, enunciation, clarity of expression, logic
Viewing	Inspect equipment	Visual analysis, describing, logic, detail/inference
Listening	Operating equipment	Auditory discrimination, concentration, noise discrimination
Touching	Surface and parts	Shape, texture, movement, tension

13

(TASK STATEMENT) REPAIR CHAIN DRIVE

TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON	PERFORMANCE KNOWLEDGE	SAFETY – HAZARD
Ball peen hammer Crescent wrench Ratchet wrench and sockets Flashlights Wiping cloth Socket head wrenches Wood blocking Pliers Box end wrenches Files, flat, rat tail, bastard, 3 cornered New cotter keys Oil	Remove protective cover Remove broken chain Remove broken sprocket Weld tooth on sprocket Hand file to dress tooth Repair chain (repair links) Clean up foreign materials Install repaired sprocket Loosen valve block Install chain Adjust tension on chain Align sprockets Tighten valve block Replace cover Fill with proper oil Run and check	Safety glasses Observe pinch points All files to have handles [Smoking not permitted where flammable liquids and paint are being used/store or posted] [Report all injuries]

DECISIONS	CUES	ERRORS
Determine whether repair or replace sprocket Determine whether to repair broken chain	Condition and life span of parts Foreign object present	Machine failure under load

41

(TASK STATEMENT) REPAIR CHAIN DRIVE

SCIENCE	MATH – NUMBER SYSTEMS
Simple machines used to gain mechanical advantage [sprocket] Work input, work output, friction and efficiency in simple machines (work output) [Effects of lubrication] Fluids under pressure [oil pump fluids under pressure] Read and interpret charts, tables and/or graphs Inertia and momentum Motion resulting from two or more forces acting on a point in a body [motion from a fixed point] Arrangement of molecules, atoms and ions and the effect on structure and strength of materials	Measures of length Measure with the Metric and English system and convert between them Operating Dimensions

COMMUNICATIONS

PERFORMANCE MODES	EXAMPLES	SKILLS/CONCEPTS
Reading	Repair service order	Comprehension, detail/inference, trade terminology
	Parts and repair manual	Description of mechanism, definition, instructions
Speaking	Instructions to operator	Trade terminology, enunciation, clarity of expression, logic
Writing	Requisition for parts	Penmanship, spelling, classification, terminology
Viewing	Equipment	Visual analysis, describing, logic, detail/inference

(TASK STATEMENT) MAINTAIN CHAIN DRIVE

TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON	PERFORMANCE KNOWLEDGE	SAFETY – HAZARD
Ratchet and sockets Socket head wrenches Hammer Wiping cloth	Remove cover Align sprockets Adjust chain tension Clean oil sump Replace cover	Safety glasses Pinch points Oil spills Slips and falls [Smoking not permitted where flammable liquids and paint are being used/stored or posted] [Report all injuries]
DECISIONS	**CUES**	**ERRORS**
Determine maintenance services to perform	Standard preventative maintenance schedule	Machine failure under load

(TASK STATEMENT) MAINTAIN CHAIN DRIVE

SCIENCE	MATH – NUMBER SYSTEMS
Simple machines used to gain mechanical advantage [sprocket] Work input, work output, friction and efficiency in simple machines (work output) [Effects of lubrication] Fluids under pressure [pressures, correct lubrication] Inertia and momentum	Operating dimensions

COMMUNICATIONS

PERFORMANCE MODES	EXAMPLES	SKILLS/CONCEPTS
Reading	Preventative maintenance	Comprehension, detail/inference, description of mechanism, trade terminology
Speaking	Instructions to operator	Trade terminology, enunciation, clarity of expression, logic
Viewing	Equipment	Visual analysis, decribing, logic, detail/inference

Duty B Inspecting, Repairing, and Maintaining Direct Drive

1 Inspect direct drive coupling
2 Repair direct drive coupling
3 Maintain direct drive coupling

(TASK STATEMENT) INSPECT DIRECT DRIVE COUPLING

TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON	PERFORMANCE KNOWLEDGE	SAFETY – HAZARD
Flashlight Wiping cloth Socket head wrenches Socket wrenches Screwdrivers	Remove inspection plate Observe while running Listen for unusual noise Feel vibration Try to achieve harmonics of coupling (Adjust speed to remove) Stop machine, feel heat of couplings Observe lubrication	Safety glasses Caution - moving parts Grease or oil spills [Smoking not permitted where flammable liquids and paint are being used/stored or posted] [Report all injuries]

DECISIONS	CUES	ERRORS
Determine repairs needed	Condition of equipment, vibration, heat	Machine failure under load

(TASK STATEMENT) INSPECT DIRECT DRIVE COUPLING

SCIENCE	MATH – NUMBER SYSTEMS
Hookes Law Work input, work output, friction and efficiency in simple machines [Effects of lubrication] Resistance of materials to change in shape [twisting, bending] Harmonies (vibration noise factor) Relationship of force to distortion in an elastic body	Operating dimensions

COMMUNICATIONS

PERFORMANCE MODES	EXAMPLES	SKILLS/CONCEPTS
Reading	Inspection order	Comprehension, detail/inference, trade terminology
Speaking	Instructions of operator	Trade terminology, enunciation, clarity of expression, logic
Viewing	Inspect equipment	Visual analysis, describing, logic, detail/inference
Listening	Operating equipment	Auditory discrimination, concentration, noise discrimination
Touching	Surface and parts	Shape, texture, movement, tension

(TASK STATEMENT) REPAIR DIRECT DRIVE COUPLING

TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON	PERFORMANCE KNOWLEDGE	SAFETY – HAZARD
Ratchet and sockets Socket head wrenches File Two dial indicators Aviation snips Shim stock (brass) Electric drill motor and drills Extension cord Reamer Flashlight Inspection mirror Straight edge Grease (if required) Grease gun Taper pins	Lock out main switch Remove guard Remove motor mount bolts Loosen coupling set screws Slide motor back Remove coupling Deburr shafts Align motor shaft with gear box shaft Drill and ream two opposing corners for taper pins Move motor back Realign motor Install taper pins and mounting bolts Install coupling Lubricate as required Install guard Run and check	Safety glasses File handle on all files Lock out main switch Smoking not permitted where flammable liquids and paint are being used or stored or where posted Report all injuries Check for pinch points Ear plugs to be worn in a high noise level area
DECISIONS	**CUES**	**ERRORS**
Determine whether to repair or replace worn coupling	Misalignment: lack of lubricant, condition and life span of parts	Machine failure under load

(TASK STATEMENT) REPAIR DIRECT DRIVE COUPLING

SCIENCE	MATH – NUMBER SYSTEMS
Work input, work output, friction and efficiency in simple machines [Effects of lubrication] Relationship of force to distortion in an elastic body Resistance of materials to change in shape [twisting, and bending] Perfect elasticity (Hookes Law) Harmonies	Measure of length Measure of time and speed Operating dimensions

COMMUNICATIONS

PERFORMANCE MODES	EXAMPLES	SKILLS/CONCEPTS
Reading	Repair service order	Comprehension, detail/inference, trade terminology
	Parts and repair manual	Description of mechanism, definition, instructions
Speaking	Instruction to operator	Trade terminology, enunciation, clarity of expression, logic
Writing	Requisition for parts	Penmanship, spelling, classification, terminology
Viewing	Equipment	Visual analysis, describing, logic, detail/inference

(TASK STATEMENT) MAINTAIN DIRECT DRIVE COUPLING

TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON	PERFORMANCE KNOWLEDGE	SAFETY – HAZARD
Socket head wrenches Ratchet and sockets Screwdrivers Flash light Grease gun Grease	Lock out main switch Remove guard Tighten motor mount screws and gear box screws Tighten coupling set screws Tighten coupling cover screws Lubricate coupling Install guard Run and check	Safety glasses Lock out main switch Watch for pinch points Oil, grease or debris on floor [Smoking not permitted where flammable liquids and paint are being used/stored or posted] [Report all injuries]

DECISIONS	CUES	ERRORS
Determine maintenance services to perform	Standard preventative maintenance schedule	Machine failure under load

(TASK STATEMENT) MAINTAIN DIRECT DRIVE COUPLING

SCIENCE	MATH – NUMBER SYSTEMS
Hookes Law Relationship of force to distortion in an elastic body Resistance of materials to change in shape [twisting and bending] Harmonies Effects of lubrication	Measure of speed and time [speed and RPM] Operating dimensions

COMMUNICATIONS

PERFORMANCE MODES	EXAMPLES	SKILLS/CONCEPTS
Reading	Preventative maintenance schedule	Comprehension, detail/inference, description of mechanism, trade terminology
Speaking	Instructions to operator	Trade terminology, enunciation, clarity of expression, logic
Viewing	Equipment	Visual analysis, describing, logic, detail/inference

Duty C Inspecting, Repairing, and Maintaining Flat Belt

1 Inspect flat belt drive
2 Repair flat belt drive
3 Maintain flat belt drive

(TASK STATEMENT) INSPECT FLAT BELT DRIVE

TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON	PERFORMANCE KNOWLEDGE	SAFETY – HAZARD
Flashlight	Check lagging on head pully Check belt tension Check wear on belt Check alignment Check mounting bolts Check idler bearings Check for vibration Check grease in motor bearing Check shaft bearing Check driven shaft for whip Check take-up adjustment	Safety glasses Grease on floor Debris on floor [Smoking not permitted where flammable liquids and paint are being used/stored or posted] [Report **all** injuries]

DECISIONS	CUES	ERRORS
Determine repairs needed	Condition of equipment, vibration, tension, alignment	Machine failure under load

(TASK STATEMENT) INSPECT FLAT BELT DRIVE

SCIENCE	MATH – NUMBER SYSTEMS
Simple machines used to gain mechanical advantage [belts and pulleys] Work input, work output, friction and efficiency in simple machines [friction] Effect of heating and cooling on expansion of materials [change of dimension] Composition of matter, including protons, neutrons, electrons, atoms, molecules, elements [composition of matter] Relationship of force to distortion in an elastic body [elastic body] Resistance of materials to change in shape [stretching]	Measures of length, width, thickness Operating dimensions

COMMUNICATIONS

PERFORMANCE MODES	EXAMPLES	SKILLS/CONCEPTS
Reading	Inspection order	Comprehension, detail/inference, trade terminology
Speaking	Instructions to operator	Trade terminology, enunciation, clarity of expression, logic
Viewing	Inspect equipment	Visual analysis, describing, logic, detail/inference
Listening	Operating equipment	Auditory discrimination, concentration, noise discrimination
Touching	Surface and parts	Shape, texture, movement, tension

(TASK STATEMENT) REPAIR FLAT BELT DRIVE

TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON	PERFORMANCE KNOWLEDGE	SAFETY – HAZARD
Belt clamps Come-a-long Square Belt knife Hammer Lacing Crescent wrenches Side cuts	Release tension on idler roll Remove lacing pin from belt Fasten belt clamps to belt Ingage come-a-long to overlap belt Mark belt to desired length Square both ends Cut belts to remove excess Install new lacing Operate come-a-long to install pin Release come-a-long Remove belt clamps Adjust take up idler Run and check belt	Safety glasses No finger rings or watches To protect one's self from moving equipment, rope off or barricade area around machine Observe pinch points [Smoking not permitted where flammable liquids and paint are being used/stored or posted] [Report all injuries]

DECISIONS	CUES	ERRORS
Determine if belt is slipping	Tension	Stretched belt

(TASK STATEMENT) REPAIR FLAT BELT DRIVE

SCIENCE	MATH – NUMBER SYSTEMS
Simple machines used to gain mechanical advantage [pulleys and belts] Work input, work output, friction and efficiency in simple machines [friction] Effect of heating and cooling on expansion of materials [change of dimension] Composition of matter, including protons, neutrons, electrons, atoms, molecules, elements [composition of matter] Relationship of force to distortion in an elastic body Resistance of materials to change in shape [stretching]	Measures of length, width and thickness Operating dimensions

COMMUNICATIONS

PERFORMANCE MODES	EXAMPLES	SKILLS/CONCEPTS
Reading	Repair service order	Comprehension, detail/inference, trade terminology
	Parts and repair manual	Description of mechanism, definition, instructions
Speaking	Instructions to operator	Trade terminology, enunciation, clarity of expression, logic
Writing	Requisition for parts	Penmanship, spelling, classification, terminology
Viewing	Equipment	Visual analysis, describing, logic, detail/inference

(TASK STATEMENT) MAINTAIN FLAT BELT DRIVE

TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON	PERFORMANCE KNOWLEDGE	SAFETY – HAZARD
Grease Grease gun Crescent wrench Lacing pin	Replace belt lacing pin Adjust take-up Adjust alignment Lubricate idler	Safety glasses Observe pinch points Apply crescent wrench in proper manner to prevent jaws from spreading [Smoking not permitted where flammable liquids and paint are being used/stored or posted] [Report all injuries]
DECISIONS	**CUES**	**ERRORS**
Determine maintenance services to perform	Standard preventative maintenance schedule	Machine failure under load

(TASK STATEMENT) MAINTAIN FLAT BELT DRIVE

SCIENCE	MATH – NUMBER SYSTEMS
Resistance of materials to change in shape Accommodation of materials to change in shape	Measures of length, width, and thickness Operating dimensions

COMMUNICATIONS

PERFORMANCE MODES	EXAMPLES	SKILLS/CONCEPTS
Reading	Preventative maintenance schedule	Comprehension, detail/inference, description of mechanism, trade terminology
Speaking	Instructions to operator	Trade terminology, enunciation, clarity of expression, logic
Viewing	Equipment	Visual analysis, describing, logic, detail/inference

Duty D Inspecting, Repairing, and Maintaining Gear Drive

1 Inspect open gear drive
2 Repair open gear drive
3 Maintain open gear drive

(TASK STATEMENT) INSPECT OPEN GEAR DRIVE

TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON	PERFORMANCE KNOWLEDGE	SAFETY – HAZARD
Work platform Ratchet wrench and socket Ball peen hammer Flashlight Socket head wrenches	Install work platform Remove guard Run continuously Listen for knocks Observe bull gear for wobble Observe pinion shaft for whip Check bearings for heat Observe pinion gear wobble Inspect taper keys for looseness Hammer blows for cracked gear Hammer blows for cracked shaft Verify correct grease	Safety glasses Pinch points No ''make shift'' defective Scaffolds, rigging or staging [Smoking not permitted where flammable liquids and paint are being used/stored or posted] [Report all injuries]
DECISIONS	**CUES**	**ERRORS**
Determine repairs needed	Condition of gear drive:sound	Machine failure under load

(TASK STATEMENT) **INSPECT OPEN GEAR DRIVE**

SCIENCE	MATH – NUMBER SYSTEMS
Arrangement of molecules, atoms, ions, and the effect on structure and strength of materials Effect of heating and cooling on state of matter Effects of lubrication	Measure length, width and thickness Operating dimensions

COMMUNICATIONS

PERFORMANCE MODES	EXAMPLES	SKILLS/CONCEPTS
Reading	Inspection order	Comprehension, detail/inference, trade terminology
Speaking	Instructions to operator	Trade terminology, enunciation, clarity of expression, logic
Viewing	Inspect equipment	Auditory discrimination, concentration, noise discrimination
Touching	Surface and parts	Shape, texture, movement, torsion

(TASK STATEMENT) **REPAIR** OPEN GEAR DRIVE

TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON	PERFORMANCE KNOWLEDGE	SAFETY – HAZARD
Ratchet wrenches and sockets Socket head wrenches Ball peen hammer (medium) Brass rod Flashlight File Emory cloth Gear puller Center punch Open gear lubricant Putty knife Work platform Feeler gauges	Properties of open gear lubricant Place work platform Remove guard Remove key Remove pinion gear Inspect shaft damage Deburr shaft Acquire new key Install pinion gear on shaft, adjust clearance Align keyways Match ''witness'' marks Install new wedge key Lubricate gears Replace guard Unlock switch-check operation	Safety glasses Secure main switch (lock out) No horse play Watch for fork trucks Check for pinch points Handle for file [Smoking not permitted where flammable liquids and paint are being used/stored or posted] [Report all injuries]

DECISIONS	CUES	ERRORS
Determine if key is sheared	Condition and life span of parts	Machine failure under load

(TASK STATEMENT) REPAIR OPEN GEAR DRIVE

SCIENCE	MATH – NUMBER SYSTEMS
Inertia and momentum Work input, work output, friction and efficiency in simple machines [friction] Effects of friction on work processes and product quality Arrangement of molecules, atoms, ions and the effect on structure and strength of materials Hook's Law, Electrolysis Shear modulus or the coefficiency of rigidity is the ratio of the stress to strain for the case of a shear or a twist; it the shearing stress divided by the fractional shear Effects of heating and cooling on state of matter [gaskets] Resistance of materials to change in shape [to torque] Effects of eccentric loading; of wear on gear Transfer of heat from one body to another [heat on materials] Effect of lubrication; of severe vibration on materials Relationship of force to distortion in an elastic body	Torque (inch pounds) = force pounds x radius (inches) Simple machines used to gain mechanical advantage [gears] Operating dimensions

COMMUNICATIONS

PERFORMANCE MODES	EXAMPLES	SKILLS/CONCEPTS
Reading	Repair service order	Comprehension, detail/inference, trade terminology
	Parts and repair manual	Description of mechanism, definition, instructions
Speaking	Instructions to operator	Trade terminology, enunciation, clarity of expression, logic
Writing	Requisition for parts	Penmanship, spelling, classification, terminology
Viewing	Equipment	Visual analysis, describing, logic. detail/inference

(TASK STATEMENT) **MAINTAIN OPEN GEAR DRIVE**

TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON	PERFORMANCE KNOWLEDGE	SAFETY – HAZARD
Ratchet and socket Ball pean hammer File **Work platform** **Flashlight** Open gear lubricant **Putty knife**	Place work platform Remove guard Clean pinion and bull gear Adjust clearance between teeth Deburr teeth pinion and bull gear **Set wedge keys firmly** Lubricate **Replace guard**	Safety glasses Pinch points [Smoking not permitted where flammable liquids and paint are being used/stored or posted] [Report all injuries]

DECISIONS	CUES	ERRORS
Determine maintenance services to perform	Standard preventative maintenance schedule	Machine failure under load

37

(TASK STATEMENT) MAINTAIN OPEN GEAR DRIVE

SCIENCE	MATH – NUMBER SYSTEMS
Effects of friction on work processes and product quality Torque Effects of lubrication	Measure of length, width and thickness Operating dimensions

38

COMMUNICATIONS

PERFORMANCE MODES	EXAMPLES	SKILLS/CONCEPTS
Reading	Preventative maintenance schedule	Comprehension, detail/inference, description of mechanism, trade terminology
Speaking	Instructions to operator	Trade terminology, enunciation, clarity of expression, logic
Viewing	Equipment	Visual analysis, describing, logic, detail/inference

38

Duty E Inspecting, Repairing, and Maintaining Gear Box Drive

1 Inspect gear box drive
2 Repair gear box drive
3 Maintain gear box drive

(TASK STATEMENT) INSPECT GEAR BOX DRIVE

TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON	PERFORMANCE KNOWLEDGE	SAFETY – HAZARD
Flashlight Wiping cloth Socket head cap screw wrenches Eye bolt Nylon sling Chain hoist Ladder Tag line	Listen to gear box run Feel for heat Smell for unusual odor Vibration factor Check oil level leaks Shut off Secure safety switch Check mounting screws, external Remove cover plate and secure Inspect gears (visual) Inspect bearings feel end play Inspect shafting Inspect breather (clean) Inspect oil residue, sludge Inspect oil seals and gaskets Replace cover	Safety glasses Oil spills Falls from ladder Smoking could cause fire [Smoking not permitted where flammable liquids and paint are being used/stored or posted] [Report all injuries]

DECISIONS	CUES	ERRORS
Determine repairs needed	Unusual noises, temperature, odor, vibrations	Machine failure under load

(TASK STATEMENT) INSPECT GEAR BOX DRIVE

SCIENCE	MATH – NUMBER SYSTEMS
Effect of heating and cooling on state of matter [gaskets] Simple machines used to gain mechanical advantage Work input, work output, friction and efficiency in simple machines Resistance to torque Effect of wear on gear Transfer of heat from one body to another Effect of severe vibration on materials Effect of eccentric loading Effect of heat on materials Relationship of force to distortion in an elastic body Arrangement of molecules, atoms and ions and the effect on structure and strength of materials Resistance of materials to change in shape Effects of lubrication	Liquid and dry measures [liquid measures] Operating dimensions

COMMUNICATIONS

PERFORMANCE MODES	EXAMPLES	SKILLS/CONCEPTS
Reading	Inspection order	Comprehension, detail/inference, trade terminology
Speaking	Instructions to operator	Trade terminology, enunciation, clarity of expression, logic
Viewing	Inspect equipment	Visual analysis, describing, logic, detail/inference
Listening	Operating equipment	Auditory discrimination, concentration, noise discrimination
Touching	Surface and parts	Shape, texture, movement, torsion

41

(TASK STATEMENT) REPAIR GEAR BOX DRIVE

42

TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON	PERFORMANCE KNOWLEDGE	SAFETY – HAZARD
Socket head wrenches Persuader(½-inch pipe, 12-inch long) Drain pan Wiping cloth Work bench Ball peen hammer Brass rod File Flashlight Stoddard solvent Lubricants	Remove cover plates Drain oil Inspect gears and bearings Remove broken parts (teeth) Remove shaft with broken gear Remove shaft with companion gear Flush and clean box Wipe dry Replace gear and mating gear Flush and clean box Wipe dry Replace gear and mating gear in box Reinstall gear train and bearings Reinstall retainer caps Reinstall cover plate Fill with proper oil to desired level Run and check for operation Know properties and addition of oil	Safety glasses Oil on floor Operator shut off machine and secure Never pour flammable liquids in sewers or drains Use caution when working on machines that are jammed [Smoking not permitted where flammable liquids and paint are being used/stored or posted] [Report all injuries]
DECISIONS	**CUES**	**ERRORS**
Determine if the trains locked Determine whether to repair or replace parts	Defective gear Condition and life span of parts	Machine failure under load

(TASK STATEMENT) REPAIR GEAR BOX DRIVE

SCIENCE	MATH – NUMBER SYSTEMS
Lubricants Arrangement of molecules, atoms and ions and the effect on structure and strength of materials Work input, work output, friction and efficiency in simple machines Effect of heating and cooling on expansion of materials Simple machines used to gain mechanical advantage Effects of lubricants	Liquid measure Operating dimensions

COMMUNICATIONS

PERFORMANCE MODES	EXAMPLES	SKILLS/CONCEPTS
Reading	Repair service order	Comprehension, detail/inference, trade terminology
	Parts and repair manual	Description of mechanism, definition, instructions
Speaking	Instruction to operator	Trade terminology, enunciation, clarity of expression, logic
Writing	Requisition for parts	Penmanship, spelling, classification, terminology
Viewing	Equipment	Visual analysis, describing, logic, detail/inference

(TASK STATEMENT) MAINTAIN GEAR BOX DRIVE

TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON	PERFORMANCE KNOWLEDGE	SAFETY – HAZARD
Flashlight Wiping cloth Socket head wrenches Small screwdriver Large screwdriver **Lubricants**	Check oil level Check for leaks Check for hot bearings Check for odor of hot oil Check for loose cap screws Listen for noise Feel for vibration Properties of lubricant	Safety glasses Whenever more than one employee is working on the same equipment, each employee should attach safety lock to the switch, and remove it only when job is completed No spitting on floor or equipment [Smoking not permitted where flammable liquids and paint are being used/stored or posted] [Report all injuries]

DECISIONS	CUES	ERRORS
Determine maintenance services to perform	Standard preventative maintenance schedule	Machine failure under load

(TASK STATEMENT) MAINTAIN GEAR BOX DRIVE

SCIENCE	MATH – NUMBER SYSTEMS
Simple machines used to gain mechanical advantage Composition of matter, including protons, neutrons, electrons, atoms, molecules, elements Arrangement of molecules, atoms and ions and the effect on structure and strength of materials Amount of oil too much/too little Oil grooves Effects of lubricants	Liquid and dry measures Operating dimensions

COMMUNICATIONS

PERFORMANCE MODES	EXAMPLES	SKILLS/CONCEPTS
Reading	Preventative maintenance schedule	Comprehension, detail/inference, description of mechanism, trade terminology
Speaking	Instructions to operator	Trade terminology, enunciation, clarity of expression, logic
Viewing	Equipment	Visual analysis, describing, logic, detail/inference

45

Duty F Inspecting, Repairing, and Maintaining Rack and Pinion Drive

1 Inspect rack and pinion drive
2 Repair rack and pinion drive
3 Maintain rack and pinion drive

(TASK STATEMENT) INSPECT RACK AND PINION DRIVE

TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON	PERFORMANCE KNOWLEDGE	SAFETY – HAZARD
Flashlight Wiping cloth Lubricants	Lock out main switch Wipe and clean rack and pinion Inspect for burrs Inspect for bent or broken teeth Hand operate for smooth operation Relubricate gears	Safety glasses Oil spills [Smoking not permitted where flammable liquids and paint are being used/stored or posted] [Report all injuries]
DECISIONS	**CUES**	**ERRORS**
Determine repairs needed	Burrs Condition and life span of parts	Machine failure under load

(TASK STATEMENT) INSPECT RACK AND PINION DRIVE

SCIENCE	MATH – NUMBER SYSTEMS
Simple machines used to gain mechanical advantage [gears] Work input, work output, friction and efficiency in simple machines Inertia and momentum Arrangement of molecules, atoms and ions and the effect on structure and strength of materials Resistance of materials to change in shape Effects of lubricants	Measures of length, width and thickness Operating dimensions

COMMUNICATIONS

PERFORMANCE MODES	EXAMPLES	SKILLS/CONCEPTS
Reading	Inspection order	Comprehension, detail/inference, trade terminology
Speaking	Instructions to operator	Trade terminology, enunciation, clarity of expression, logic
Viewing	Inspect equipment	Visual analysis, describing, logic, detail/inference
Listening	Operating equipment	Auditory discrimination, concentration, noise discrimination
Touching	Surface and parts	Shape, texture, movement, torsion

(TASK STATEMENT) REPAIR RACK AND PINION DRIVE

TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON	PERFORMANCE KNOWLEDGE	SAFETY – HAZARD
Socket head wrenches Ratchet wrench and sockets Hammer Flashlight Gear puller File Lubricants	Lock out main switch Remove hand crank Remove shaft bearing assembly Remove broken pinion Install new pinion on shaft Reinstall assembly in saddle Reinstall hand crank Operate hand crank for smooth operation Lubricants	Safety glasses Pinch points Handle for file [Smoking not permitted where flammable liquids and paint are being used/stored or posted] [Report all injuries]

DECISIONS	CUES	ERRORS
Determine whether to repair or replace pinion gear and rack	Condition and life span of parts	Carraige lock Unreleased, machine failure under load

(TASK STATEMENT) REPAIR RACK AND PINION DRIVE

SCIENCE	MATH – NUMBER SYSTEMS
Simple machines used to gain mechanical advantage [gears] Work input, work output, friction and efficiency in simple machines Inertia and momemtum [body at rest, body in motion] Arrangement of molecules, atoms and ions and the effect on structure and strength of materials [strength of material] Resistance of materials to change in shape Effects of lubrication	Measure of length [pinion dimensions] Wrench dimensions

COMMUNICATIONS

PERFORMANCE MODES	EXAMPLES	SKILLS/CONCEPTS
Reading	Repair service order	Comprehension, detail/inference, trade terminology
	Parts and repair manual	Descirption of mechanism, definition, instructions
Speaking	Instructions to operator	Trade terminology, enunciation, clarity of expression, logic
Writing	Requisition for parts	Penmanship, spelling, classification, terminology
Viewing	Equipment	Visual analysis, describing, logic, detail/inference

(TASK STATEMENT) MAINTAIN RACK AND PINION DRIVE

TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON	PERFORMANCE KNOWLEDGE	SAFETY – HAZARD
Brush Stoddard solvent Wiping cloth Flashlight File Lubricants	Lock out main switch Clean rack and pinion with small brush and solvent Wipe dry Deburr rack and pinion Wipe clean Lubricate Check for smooth operation	Safety glasses File handle on file [Smoking not permitted where flammable liquids and paint are being used/stored or posted] [Report all injuries]

DECISIONS	CUES	ERRORS
Determine maintenance services to perform	Standard preventative maintenance schedule	Machine failure under load

(TASK STATEMENT) MAINTAIN RACK AND PINION DRIVE

SCIENCE	MATH – NUMBER SYSTEMS
Simple machines used to gain mechanical advantage [gears] Work input, work output, friction and efficiency in simple machines Inertia and momentum Arrangement of molecules, atoms and ions and the effect on structure and strength of materials Resistance of materials to change in shape Effects of lubricants	Wrench dimensions Operating dimensions

COMMUNICATIONS

PERFORMANCE MODES	EXAMPLES	SKILLS/CONCEPTS
Reading	Preventative maintenance schedule	Comprehension, detail/inference, description of mechanism, trade terminology
Speaking	Instructions to operator	Trade terminology, enunciation, clarity of expression, logic
Viewing	Equipment	Visual analysis, describing, logic, detail/inference

Duty G Inspecting, Repairing, and Maintaining Ring and Pinion Drive

1 Inspect ring and pinion drive of vertical lathe
2 Repair ring and pinion drive of vertical lathe
3 Maintain ring and pinion drive of vertical lathe

(TASK STATEMENT) INSPECT RING AND PINION DRIVE OF VERTICAL LATHE

54

TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON	PERFORMANCE KNOWLEDGE	SAFETY – HAZARD
Flashlight Wiping cloth Feeler gauges	Raise rail to extreme position Remove inspection plate in chuck Check retaining nut Reinstall plate Check ring and pinion for burrs, broken teeth, wear Listen to operation Feel for vibration Check lubrication	Safety glasses Caution - moving machinery [Smoking not permitted where flammable liquids and paint are being used/stored or posted] [Report all injuries]

DECISIONS	CUES	ERRORS
Determine repairs needed	Burrs, broken teeth; unusual sounds and vibrations; condition and lifespan of parts	Machine failure under load

(TASK STATEMENT) **INSPECT RING AND PINION DRIVE OF VERTICAL LATHE**

SCIENCE	MATH – NUMBER SYSTEMS
Simple machines used to gain mechanical advantage [gears] Work input, work output, friction and efficiency in simple machines Fluids under pressure - lubricants Transfer of energy from one form to another Inertia and momentum Effects of lubricants	Operating dimensions Operating clearances

COMMUNICATIONS

PERFORMANCE MODES	EXAMPLES	SKILLS/CONCEPTS
Reading	Inspection order	Comprehension, detail/inference, trade terminology
Speaking	Instructions to operator	Trade terminology, enunciation, clarity of expression, logic
Viewing	Inspect equipment	Visual analysis, describing, logic, detail/inference
Listening	Operating equipment	Auditory discrimination, concentration, noise discrimination
Touching	Surface and parts	Shape, texture, movement, tension

(TASK STATEMENT) REPAIR RING AND PINION DRIVE OF VERTICAL LATHE

TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON	PERFORMANCE KNOWLEDGE	SAFETY – HAZARD
Ratchet wrench and socket extension Socket head wrenches Torque wrench Feeler gauge Wiping rags Flashlight Oil can, oil Pick-up clamps Eye bolt Three-legged chocker Fork truck or overhead crane	Raise rail, move heads to extreme position Lock out main switch Remove inspaction place in chuck Remove retaining nut Install three pick-up clamps on chuck Lift off chuck Lay chuck on block - inverted Remove pinion gear and gear box Remove broken ring gear on chuck Install new ring gear on chuck Remove pinion gear and shaft Install new pinion gear, shaft, and bearings Reinstall pinion gear, gear box, and chuck Tighten retaining nut (torque) Adjust pinion gear to ring gear, use feeler gauge Lubricate, run and check Replace inspection plate in chuck	Safety glasses Pinch points Smoking not permitted where flammable liquids and paint are being used/stored or posted Report all injuries

DECISIONS	CUES	ERRORS
Determine whether to repair or replace parts	Condition and life span of parts	Machine failure under load

(TASK STATEMENT) REPAIR RING AND PINION DRIVE OF VERTICAL LATHE

SCIENCE	MATH – NUMBER SYSTEMS
Simple machines used to gain mechanical advantage [gears] Work input, work output, friction and efficency in simple machines Fluids under pressure Transfer of energy from one form to another Inertia and momentum Torque Effects of lubricants	Operating dimensions

LS

COMMUNICATIONS

PERFORMANCE MODES	EXAMPLES	SKILLS/CONCEPTS
Reading	Repair service order	Comprehension, detail/inference, trade terminology
Speaking	Instructions to operator	Trade terminology, enunciation, clarity of expression
Writing	Requisition for parts	Penmanship, spelling, classification, terminology
Viewing	Equipment	Visual analysis, describing, logic, detail/inference

57

(TASK STATEMENT) MAINTAIN RING AND PINION DRIVE OF VERTICAL LATHE

TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON	PERFORMANCE KNOWLEDGE	SAFETY – HAZARD
Flashlight Feeler gauge Ratchet wrench, sockets and extension Wiping cloth	Raise rail to extreme height Lock out main switch Remove inspection plate Adjust retaining nut if required Reinstall plate Check and adjust gear tooth clearance Deburr teeth - gear and pinion Lubricate as required Run and check	Safety glasses Pinch points [Smoking not permitted where flammable liquids and paint are being used/stored or posted] [Report all injuries]

DECISIONS	CUES	ERRORS
Determine maintenance services to perform	Standard preventative maintenance schedule	Machine failure under load

(TASK STATEMENT) MAINTAIN RING AND PINION DRIVE OF VERTICAL LATHE

SCIENCE	MATH – NUMBER SYSTEMS
Simple machines used to gain mechanical advantage [gears] Work input, work output, friction and efficiency in simple machines Fluids under pressure [lubricants] Transfer of energy from one form to another Inertia and momentum Effects of lubricants	Basic math skills Feeler gauge Operating dimensions

COMMUNICATIONS

PERFORMANCE MODES	EXAMPLES	SKILLS/CONCEPTS
Reading	Preventative maintenance schedule	Comprehension, detail/inference, description of mechanism, trade terminology
Speaking	Instructions to operator	Trade terminology, enunciation, clarity of expression, logic
Viewing	Equipment	Visual analysis, describing, logic, detail/inference

Duty H Inspecting, Repairing, and Maintaining Variable Speed Drive

1 Inspect variable speed drive
2 Repair variable speed drive
3 Maintain variable speed drive

(TASK STATEMENT) INSPECT VARIBLE SPEED DRIVE

TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON	PERFORMANCE KNOWLEDGE	SAFETY – HAZARD
Ratchet and sockets Flashlight Wiping cloth	Remove inspection plate Observe belt Listen for belt slap Hand feel for vibration on motor Inspect all mounting bolts Inspect variable pulleys	Safety glasses Lock out main switch Do not talk to any operator while operating a machine Ordinary prescription glasses do not protect the eyes Wear safety caps if employee has long hair [Smoking not permitted where flammable liquids and paint are being used/stored or posted] [Report all injuries]

DECISIONS	CUES	ERRORS
Determine repairs needed	Unusual sounds or vibrations; condition of equipment	Machine failure under load

(TASK STATEMENT) INSPECT VARIBLE SPEED DRIVE

SCIENCE	MATH – NUMBER SYSTEMS
Simple machines used to gain mechanical advantage [pulleys] Work input, work output, friction and efficiency in simple machines Inertia and momentum [inertia] Relationship of force to distortion in an elastic body [distortion] Resistance of materials to change in shape [stretching] Effects of lubricants	Measure of time and speed [speed-RPM] FPM = Diameter x RPM x .262 Operating dimensions

COMMUNICATIONS

PERFORMANCE MODES	EXAMPLES	SKILLS/CONCEPTS
Reading	Inspection on order	Comprehension, detail/inference, trade terminology
Speaking	Instructions to operator	Trade terminology, enunciation, clarity of expression, logic
Viewing	Inspect equipment	Visualy analysis, describing, logic, detail/inference
Listening	Operating equipment	Auditory discrimination, concentration, noise discrimination
Touching	Surface and parts	Shape, texture, movement, tension

(TASK STATEMENT) REPAIR VALIABLE SPEED DRIVE

TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON	PERFORMANCE KNOWLEDGE	SAFETY – HAZARD
Ratchet wrench and sockets Socket head wrenches Snap ring wrench Flashlight Hammer Feet per minute meter	Lock out master switch Remove guard and conveyor belt from variable drive Retract motor to relax spring in drive pulley; loosen motor from base Remove belt from driver and driven pulley, spring loaded pulley from shaft, snap ring from sheave, and spiral spring cartridge and nylon key Install new spiral spring cartridge and key; lube shaft Install snap ring to shaft and new belt Align motor and bolt down Rotate by hand to equalize belt Start motor for operational check Install conveyor belt Run conveyor–operational check Adjust pulley pitch to required feet per minute Reinstall guard	Safety glasses Never climb or walk over conveyors Never use defective hammers, punches or wrenches Never strike together material of equal hardness Smoking not permitted where flammable liquids and paint are being used/stored or posted Report all injuries

DECISIONS	CUES	ERRORS
Determine whether to repair or replace broken spring Determine whether to repair or replace damaged belt	Condition and life span of parts	Machine failure under load

(TASK STATEMENT) REPAIR VARIBLE SPEED DRIVE

SCIENCE	MATH – NUMBER SYSTEMS
Simple machines used to gain mechanical advantage [pulleys] Work input, work output, friction and efficiency in simple machines Inertia and momentum Relationship of force to distortion in an elastic body Resistance of materials to change in shape [stretching] Hooks Law Effects of lubricants	Measure of time and speed [RPM] FPM = Diameter (inches) x RPM x .262 Operating dimensions

COMMUNICATIONS

PERFORMANCE MODES	EXAMPLES	SKILLS/CONCEPTS
Reading	Repair service order	Comprehension, detail/inference, trade terminology
	Parts and repair manual	Description of mechanism, definition, instructions
Speaking	Instructions to operator	Trade terminology, enunciation, clarity of expression, logic
Writing	Requisition for parts	Penmanship, spelling, classification, terminology
Viewing	Equipment	Visual analysis, describing, logic, detail/inference

(TASK STATEMENT) MAINTAIN VARIBLE SPEED DRIVE

65

TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON	PERFORMANCE KNOWLEDGE	SAFETY – HAZARD
Grease gun Flashlight Wiping cloth	Grease all fittings Operate fast and slow for proper operation Snug up all mounting bolts	Safety glasses Lock out main switch [Smoking not permitted where flammable liquids and paint are being used/stored or posted] [Report all injuries]
DECISIONS	**CUES**	**ERRORS**
Determine maintenance services to perform	Standard preventative maintenance schedule	Machine failure under load

59

(TASK STATEMENT) MAINTAIN VARIBLE SPEED DRIVE

SCIENCE	MATH – NUMBER SYSTEMS
Simple machines used to gain mechanical advantage [pulleys] Work input, work output, friction and efficiency in simple machines Inertia and momentum [inertia] Relationship of force to distortion in an elastic body [distortion] Resistance of materials to change in shape [stretching] Effects of lubricants	Measure of time and speed [speed - RPM] FPM = Diameter x RPM x .262 Operating dimensions

COMMUNICATIONS

PERFORMANCE MODES	EXAMPLES	SKILLS/CONCEPTS
Reading	Preventative maintenance schedule	Comprehension, detail/inference, description of mechanism, trade terminology
Speaking	Instructions to operator	Trade terminology, enunciation, clarity of expression, logic
Viewing	Equipment	Visual anlaysis, describing, logic, detail/inference

Duty I Inspecting, Repairing, and Maintaining Vee Belt Drive

1 Inspect vee belt drive
2 Repair vee belt drive
3 Maintain vee belt drive

67

(TASK STATEMENT) INSPECT VEE BELT DRIVE

TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON	PERFORMANCE KNOWLEDGE	SAFETY – HAZARD
Belt tension meter Straight edge	Open door Check sheaves alignment and wear Check belt tension Check for cleanliness Inspect belts for wear Check for vibration **Check mounting bolts**	Safety glasses [Smoking not permitted where flammable liquids and paint are being used/stored or posted] [Report all injuries]

DECISIONS	CUES	ERRORS
Determine belt condition Determine if area needs cleaning	Condition of equipment; tension, vibration Noise	Machine failure under load

(TASK STATEMENT) INSPECT VEE BELT DRIVE

SCIENCE	MATH – NUMBER SYSTEMS
Simple machines used to gain mechanical advantage [pulleys] Work input, work output friction and efficiency in simple machines [friction] Effect of heating and cooling on expansion of materials Inertia and momentum Effect of friction on work processes and product quality [friction] Relationship of force to distortion in an elastic body Resistance of materials to change in shape Effects of lubricants	Relation of force to distortion in an elastic body [belt deflection under pressure] Operating dimensions

COMMUNICATIONS

PERFORMANCE MODES	EXAMPLES	SKILLS/CONCEPTS
Reading	Inspection order	Comprehension, detail/inference, trade terminology
Speaking	Instructions to operator	Trade terminology, enunciation, clarity of expression, logic
Viewing	Inspect equipment	Visual analysis, describing, logic, detail/inference
Listening	Operating equipment	Auditory discrimination, concentration, noise discrimination
Touching	Surface and parts	Shape, texture, movement, tension

(TASK STATEMENT) REPAIR VEE BELT DRIVE

TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON	PERFORMANCE KNOWLEDGE	SAFETY – HAZARD
Set of new matched belts Adjustable wrench (crescent) Flashlight Stoddard solvent Wiping cloths Knife Wire brush Debris pan Socket head wrenches Belt tension meter Sheave groove and belt guage Select-o-matic V-belt measuring device Hammer	Open inspection door Release belt tension Remove old belts Determine length, size, quantity of belts and obtain clean sheaves Inspect sheaves Bell ring sheaves Check sheave retaining screws Check alignment of sheaves and adjust Install new belts Adjust tension Close door Run and check	Safety glasses Debris on floor Oil on floor Never roll or pry belts on sheave (pinch point) Clean up all rags and material from floor upon completing assignment While working overhead, never carry tools in pockets Never use kerosene to clean parts or assemblies Auxiliary start button lock out Wrenches must never be used as hammer [Smoking not permitted where flammable liquids and paint are being used/stored or posted] [Report all injuries]
DECISIONS	**CUES**	**ERRORS**
Determine when to replace worn belts	Misalignment, grit and dirt, normal wear Cracked sheaves (pulleys) do not ring	Machine failure under load

(TASK STATEMENT) REPAIR VEE BELT DRIVE

SCIENCE	MATH – NUMBER SYSTEMS
Simple machines used to gain mechanical advantage [pulleys] Work input, work output, friction and efficiency in simple machines [friction] Effects of heating and cooling on expansion of materials Inertia and momentum Effects of friction on work processes and product quality [friction] Relationship of force to distortion in an elastic body Resistance of materials to change in shape [stretching]	Measures of length Matching length Matching belts Matching width } Chart Relationship of force to distortion in an elastic body [deflection under pressure] Operating dimensions

COMMUNICATIONS		
PERFORMANCE MODES	EXAMPLES	SKILLS/CONCEPTS
Reading	Repair service order	Comprehension, detail/inference, trade terminology
	Parts and repair manual	Description of mechanism, definition, instructions
Speaking	Instructions to operator	Trade terminology, enunciation, clarity of expression, logic
Writing	Requisition for parts	Penmanship, spelling, classification, terminology
Viewing	Equipment	Visual analysis, describing, logic, detail/inference

(TASK STATEMENT) MAINTAIN VEE BELT DRIVE

TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON	PERFORMANCE KNOWLEDGE	SAFETY – HAZARD
Stoddard solvent Wiping cloth Flashlight Adjustable wrench Straight edge Hammer Socket head wrenches (Allen) Belt tension meter	Open inspection door Clean belts (solvent) Clean sheaves and area Adjust belt tension Check and correct sheave alignment Close and secure door	Safety glasses Pinch points No finger rings [Smoking not permitted where flammable liquids and paint are being used/stored or posted] [Report all injuries]
DECISIONS	**CUES**	**ERRORS**
Determine belt condition Determine sheave condition	Standard preventative maintenance schedule	Machine failure under load

(TASK STATEMENT) MAINTAIN VEE BELT DRIVE

SCIENCE	MATH – NUMBER SYSTEMS
Simple machines used to gain mechanical advantage [pulleys] Work input, work output, friction and efficiency in simple machines [friction] Effects of heating and cooling on expansion of materials Inertia and momentum Effects of friction on work processes and product quality [friction] Relationship of force to distortion in an elastic body Resistance of materials to change in shape [stretching]	Operating dimensions

COMMUNICATIONS

PERFORMANCE MODES	EXAMPLES	SKILLS/CONCEPTS
Reading	Preventative maintenance schedule	Comprehension, detail/inference, description of mechanism, trade terminology
Speaking	Instructions to operator	Trade terminology, enunciation, clarity of expression, logic
Viewing	Equipment	Visual analysis, describing, logic, detail/inference

Duty J Inspecting, Repairing, and Maintaining Centrifugal Clutch

1 Inspect centrifugal clutch
2 Repair centrifugal clutch
3 Maintain centrifugal clutch

74

(TASK STATEMENT) INSPECT CENTRIFUGAL CLUTCH

TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON	PERFORMANCE KNOWLEDGE	SAFETY – HAZARD
Flashlight Strobotac Two indicators Inspection mirror Wiping cloth	Run system Check with strobotac (slippage) Check alignment	Safety glasses [Smoking not permitted where flammable liquids and paint are being used/stored or posted] [Report all injuries]
DECISIONS	**CUES**	**ERRORS**
Determine repairs needed	Condition of equipment, slippage, alignment, heat, smoke	Machine failure under load

(TASK STATEMENT) INSPECT CENTRIFUGAL CLUTCH

SCIENCE	MATH – NUMBER SYSTEMS
Newton's laws of motion (1-3) Centrifugal forces developed by bodies in rotation Transfer of energy from one form to another Inertia and momentum	Operating condition

COMMUNICATIONS

PERFORMANCE MODES	EXAMPLES	SKILLS/CONCEPTS
Reading	Inspection order	Comprehension, detail/inference, trade terminology
Speaking	Instructions to operator	Trade terminology, enunciation, clarity of expression, logic
Viewing	Inspect equipment	Visual analysis, describing, logic, detail/inference
Listening	Operating equipment	Auditory discrimination, concentration, noise discrimination
Touching	Surface and parts	Shape, texture, movement, tension

(TASK STATEMENT) REPAIR CENTRIFUGAL CLUTCH

TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON	PERFORMANCE KNOWLEDGE	SAFETY – HAZARD
Socket head wrenches Flash light Wiping cloth Strobotac Friction tape Feeler gauges	Lock and secure main switch Loosen set screws on rim Slide rim toward motor and shaft Remove old drive blocks **Align clutch driver and clutch** **Install new matched blocks in pairs at 180°** **Return rim and secure** **Run and check for slippage** Dispose of all parts	Safety glasses Pinch points [Smoking not permitted where flammable liquids and paint are being used/stored or posted] [Report all injuries]

DECISIONS	CUES	ERRORS
Determine whether to repair or replace worn blocks	Slippage **Fatigue of block** Hot rim-clutch Life span of equipment Smoke	• Machine failure under load

(TASK STATEMENT) REPAIR CENTRIFUGAL CLUTCH

SCIENCE	MATH – NUMBER SYSTEMS
Newton's Laws of motion (1-3) Transfer of energy from one form to another Centrifugal forces developed by bodies in rotation Inertia and momentum Effects of friction on work processess and product quality [friction]	Measure of time and speed Measure of weight Measures of temperature Operating dimensions

COMMUNICATIONS

PERFORMANCE MODES	EXAMPLES	SKILLS/CONCEPTS
Reading	Repair service order	Comprehension, detail/inference, trade terminology
	Parts and repair manual	Description of mechanism, definition, instructions
Speaking	Instructions to operator	Trade terminology, enunciation, clarity of expression, logic
Writing	Requisition of parts	Penmanship, spelling, classification, terminology
Viewing	Equipment	Visual analysis, describing, logic, detail/inference

(TASK STATEMENT) MAINTAIN CENTRIFUGAL CLUTCH

TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON	PERFORMANCE KNOWLEDGE	SAFETY – HAZARD
Socket head wrenches Flashlight Air hose Blow gun Strobotac	Lock and secure main switch Remove flange Blow out dust and dirt **Check blocks, (must be free)** Check and tighten set screws Install flange Run and check for slippage	Safety glasses Goggles Flying dust from compressed air [Smoking not permitted where flammable liquids and paint are being used/stored or posted] [Report all injuries]

DECISIONS	CUES	ERRORS
Determine maintenance services to perform	Standard preventative maintenance schedule	Machine failure under load

(TASK STATEMENT) MAINTAIN CENTRIFUGAL CLUTCH

SCIENCE	MATH – NUMBER SYSTEMS
Newton's Laws of Motion Centrifugal forces developed by bodies in rotation Transfer of energy from one form to another Inertia and momentum Friction makes heat and debris	Operating conditions

COMMUNICATIONS

PERFORMANCE MODES	EXAMPLES	SKILLS/CONCEPTS
Reading	Preventative maintenance schedule	Comprehension, detail/inference, description of mechanism, trade terminology
Speaking	Instructions to operator	Trade terminology, enunciation, clarity of expression, logic
Viewing	Equipment	Visual analysis, describing, logic, detail/inference

Duty K Inspecting, Repairing, and Maintaining Pneumatic Clutch and Brake

1 Inspect pneumatic clutch and brake
2 Repair pneumatic clutch
3 Maintain pneumatic clutch

(TASK STATEMENT) INSPECT PNEUMATIC CLUTCH AND BRAKE

TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON	PERFORMANCE KNOWLEDGE	SAFETY – HAZARD
Flashlight Wiping cloth Belt tension tester Air gauge	Shut-off machine Observe for excessive grease Frayed wiring **Inspect air hose, and air valve** Check belts through inspections hole for wear and tension Inspect clutch and brake pads for wear Check lubrication Request operator to ''dry run'' machine **Look and listen for faulty operation** Check limit switches Examine air hose with pressure Check air pressure	Safety glasses Caution - moving machinery Caution - slips and falls Grease spills [Smoking not permitted where flammable liquids and paint are being used/stored or posted] [Report all injuries]

DECISIONS	CUES	ERRORS
Determine repairs needed	Condition of equipment	Machine failure under load

(TASK STATEMENT) INSPECT PNEUMATIC CLUTCH AND BRAKE

SCIENCE	MATH – NUMBER SYSTEMS
Simple machines used to gain mechanical advantage [pulleys] Work input, workout put, friction and efficiency of simple machines [friction kinetic and potential] Effects of friction on work processes and product quality [effects of friction on wear process] Inertia and momentum Newton's Laws of motion Lubricants **Gas under pressure** Arrangement of molecules, atoms and ions and the effect on structure and strength of materials Resistance of materials to change in shape [stretching]	Operating dimensions

COMMUNICATIONS

PERFORMANCE MODES	EXAMPLES	SKILLS/CONCEPTS
Reading	Inspection order	Comprehension, detail/inference, trade terminology
Speaking	Instructions to operator	Trade terminology, enunciation, clarity of expression
Viewing	Inspection equipment	Visual analysis, describing, logic, detail/inference
Listening	Operating equipment	Auditory discrimination, concentration, noise discrimination
Touching	Surface and parts	Shape, texture, movement, tension

83

(TASK STATEMENT) REPAIR PNEUMATIC CLUTCH

R1

TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON	PERFORMANCE KNOWLEDGE	SAFETY - HAZARD
Ratchet extension and sockets Socket head wrenches Ball peen hammer New brake pads New clutch pads Grease gun Grease Wiping cloth Flashlight Extension cord and light Timber and blocking Sling and hoist Air pressure gauge	Lock out main switch Remove cover plate Block ram Shut off air supply Remove rotating air valve, solenoid valve, pad mounting housing, clutch pads, brake housing, and brake pads Bell ring disc and housing Install brake pads, brake housing, clutch pads, clutch housing, rotating air valve, and solenoid valve Lubricate bearings Check air pressure Turn on air Remove blocking Run and check operation Install cover plates	Safety glasses Grease, spills Pinch points Slips or falls Caution on compressed air Smoking not permitted where flammable liquids and paint are being used/stored or posted Report all injuries

DECISIONS	CUES	ERRORS
Determine whether to repair or replace clutch parts	Condition and life span of parts	Lack of transmitted power Ram drifts Weak ram thrust Machine failure under load

(TASK STATEMENT) REPAIR PNEUMATIC

SCIENCE	MATH – NUMBER SYSTEMS
Simple machines used to gain mechanical advantage [pulleys] Work input, work output, friction and efficiency in simple machines [friction kinetic and potential] Effects of friction on work processes and product quality Inertia and momentum Newton's Laws of Motion Lubricants Gas under pressure Arrangement of molecules, atoms and ions and the effect on structure and strength of materials Resistance of materials to change in shape [stretching] Effects of lubricants	Operating dimensions

COMMUNICATIONS

PERFORMANCE MODES	EXAMPLES	SKILLS/CONCEPTS
Reading	Repair service order	Comprehension, detail/inference, trade terminology
	Parts and repair manual	Description of mechanism, definition, instructions
Speaking	Instructions to operator	Trade terminology, enunciation, clarity of expression, logic
Writing	Requisition for parts	Penmanship, spelling, classification terminology
Viewing	Equipment	Visual analysis, describing, logic, detail/inference

85

(TASK STATEMENT) MAINTAIN PNEUMATIC CLUTCH

TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON	PERFORMANCE KNOWLEDGE	SAFETY – HAZARD
Grease gun Grease Flashlight End wrenches Air pressure gauge	Lock out main switch Lubricate bearings Check and adjust limit switches Check air pressure	Safety glasses Grease spills Pinch points Slips or falls [Smoking not permitted where flammable liquids and paint are being used/stored or posted] [Report all injuries]

DECISIONS	CUES	ERRORS
Determine maintenance services to perform	Standard preventative maintenance schedules	Machine failure under stress

(TASK STATEMENT) MAINTAIN PNEUMATIC CLUTCH

SCIENCE	MATH – NUMBER SYSTEMS
Simple machines used to gain mechanical advantage [pulleys] Work input, work output, friction and efficiency in simple machines [friction, kinetic and potential] Inertia and momentum Newton's Law of Motion Lubricants **Gas under pressure** Arrangement of molecules, atoms and ions and the effect on structure and strength of materials Resistance of materials to change in shape [stretching]	Operating dimensions

COMMUNICATIONS

PERFORMANCE MODES	EXAMPLES	SKILLS/CONCEPTS
Reading	Preventative maintenance schedule	Comprehension, detail/inference, description of mechanism, trade terminology
Speaking	Instructions to operator	Trade terminology, enunciation, clarity of expression, logic
Viewing	Equipment	Visual analysis, describing, logic, detail/inference

87

Duty L Inspecting, Repairing, and Maintaining Acme Feed Screw

1 Inspect acme feed screw
2 Repair acme feed screw (milling machine)
3 Maintain acme feed screw (milling machine)

(TASK STATEMENT) INSPECT ACME FEED SCREW

89

TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON	PERFORMANCE KNOWLEDGE	SAFETY – HAZARD
Flashlight Wiping cloth	Stop machine lock out Inspect lubrication **Hand crank table to center** Work crank back and forth to denote looseness Inspect screw for burrs and roughness, sharp corners **Check end play of screw**	Safety glasses [Smoking not permitted where flammable liquids and paint are being used/stored or posted] [Report all injuries]

DECISIONS	CUES	ERRORS
Determine if repairs are needed	Condition of equipment Rough finish out of tolerance on machined part	Machine failure under load

(TASK STATEMENT) INSPECT ACME FEED SCREW

SCIENCE	MATH – NUMBER SYSTEMS
Simple machines used to gain mechanical advantage Work input, work output, friction and efficiency in simple machines Fluids under pressure Inertia and momentum [body at rest - body in motion] Effects of friction on work processes and product quality Resistance of materials to change in shape [resist to twisting, bending] Effects of lubricants	Dimensional tolerance Operating dimensions

COMMUNICATIONS

PERFORMANCE MODES	EXAMPLES	SKILLS/CONCEPTS
Reading	Inspection order	Comprehension, detail/inference, trade terminology
Speaking	Instructions to operator	Trade terminology, enunciation, clarity of expression, logic
Viewing	Inspect equipment	Visual analysis, describing, logic, detail/inference
Listening	Operating equipment	Auditory discrimination, concentration, noise discrimination
Touching	Surface and parts	Shape, texture, movement, tension

90

(TASK STATEMENT) REPAIR ACME FEED SCREW (MILLING MACHINE)

TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON	PERFORMANCE KNOWLEDGE	SAFETY – HAZARD
Ratchet wrench and sockets Socket head set Oil Flashlight **Screwdrivers** A-frame on wheels Sling Pick up clamps Stoddard solvent Wiping cloth End wrenches Face spanner wrenches New feed screw New feed nuts New feed screw bearings	Lock out main switch Crank knee down Crank saddle out Remove tooling from table Remove end brackets cranks, **feed dials and bearings** Remove feed screw Remove table gib Remove table Remove feed nuts Install new feed nuts Replace table **Install gib and adjust** **Install new feed screw and bearings** **Adjust feed nuts** **Lube screw and check operation**	Safety glasses Pinch points Only operator to load or unload machine [Smoking not permitted where flammable liquids and paint are being used/stored or posted] [Report all injuries]

DECISIONS	CUES	ERRORS
Determine whether to install new parts or repair	Feed screw and nuts Condition and life span of parts	Machine failure under load

(TASK STATEMENT) REPAIR ACME FEED SCREW (MILLING MACHINE)

SCIENCE	MATH – NUMBER SYSTEMS
Simple machines used to gain mechanical advantage [linear motion to rotary motion] Work input, work output, friction and efficiency in simple machines [friction] Fluids under pressure [lubricant] Centrifugal forced developed by bodies in rotation [body at rest - body in motion] Effects of friction on work processes and product quality Resistance of materials to change in shape [stretching]	Wrench dimensions Measures of length [measurement] Operating dimensions

COMMUNICATIONS

PERFORMANCE MODES	EXAMPLES	SKILLS/CONCEPTS
Reading	Repair service order	Comprehension, detail/inference, trade terminology
	Parts and repair manual	Description of mechanism, definition, instructions
Speaking	Instructions to operator	Trade terminology, enunciation, clarity of expression, logic
Writing	Requisition for parts	Penmanship, spelling, classification, terminology
Viewing	Equipment	Visual analysis, describing, logic, detail/inference

92

(TASK STATEMENT)

MAINTAIN ACME FEED SCREW (MILLING MACHINE)

TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON	PERFORMANCE KNOWLEDGE	SAFETY – HAZARD
Socket head wrench Screwdriver Wiping cloth Flashlight	Lock out main switch Adjust screw linear looseness (end play) Hand crank table to extreme right Adjust feed nuts Hand crank table to extreme left Check feed nuts Assure lubrication	Safety glasses [Smoking not permitted where flammable liquids and paint are being used/stored or posted] [Report all injuries]

DECISIONS	CUES	ERRORS
Determine maintenance service to perform	Standard preventative maintenance schedule	Machine failure under load

(TASK STATEMENT) MAINTAIN ACME FEED SCREW (MILLING MACHINE)

SCIENCE	MATH – NUMBER SYSTEMS
Simple machines used to gain mechanical advantage Work input, work output, friction and efficiency in simple machines Fluids under pressure [lubricants] Inertia and momentum [bodies at rest - bodies in motion] Effects of friction on work processes and product quality Resistance of materials to change in shape Effects of lubricants	Wrench dimensions Measures of length [measurement] Operating dimensions

COMMUNICATIONS

PERFORMANCE MODES	EXAMPLES	SKILLS/CONCEPTS
Reading	Preventative maintenance schedule	Comprehension, detail/inference, discription of mechanism, trade terminology
Speaking	Instructions to operator	Trade terminology, enunciation, clarity of expression, logic
Viewing	Equipment	Visual analysis, describing, logic, detail inference

94

Duty M - Inspecting, Repairing, and Maintaining Ball Nut Feed Screw

1 Inspect ball screw nut feed
2 Repair ball screw looseness
3 Maintain ball screw

95

(TASK STATEMENT) INSPECT BALL SCREW NUT FEED

TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON	PERFORMANCE KNOWLEDGE	SAFETY – HAZARD
Flashlight Lint free wiping cloths Indicator	Lock out main switch Wipe screw thread clean of oil and dirt Inspect screw thread for wear and roughness Indicate table for linear motion Inspect mounting screws Hand crank table end to end, feel for smooth operation Listen for unusual sounds (grinding) Check lubrication	Safety glasses Clean lint free wiping cloth [Smoking not permitted where flammable liquids and paint are being used/stored or posted] [Report all injuries]

DECISIONS	CUES	ERRORS
Determine repairs needed	Unusual sounds, condition of equipment	Machine failure under load

(TASK STATEMENT) INSPECT BALL SCREW NUT FEED

SCIENCE	MATH – NUMBER SYSTEMS
Work input, work output, friction and efficiency in simple machines Effect of heating and cooling on expansion of materials [change of dimensions] Fluids under pressure [oil under pressure] Composition of matter, including protons, neutrons, electrons, atoms, molecules, elements [composition of matter] Transfer of energy from one form to another Inertia and momentum **Effect of friction on work processes and product quality** Resistance of materials to change in shape Effects of lubrication	Plus and minus on indicator Operating dimensions

COMMUNICATIONS		
PERFORMANCE MODES	EXAMPLES	SKILLS/CONCEPTS
Reading	Inspection order	Comprehension, detail/inference, trade terminology
Speaking	Instructions to operator	Trade terminology, enunciation, clarity of expression, logic
Viewing	Inspection of equipment	Visual analysis, describing, logic, detail/inference
Listening	Operating equipment	Auditory discrimination, concentration noise discrimination
Touching	Surface and parts	Shape, texture, movement, tension

97

(TASK STATEMENT) REPAIR BALL SCREW LOOSENESS

TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON	PERFORMANCE KNOWLEDGE	SAFETY – HAZARD
Flashlight Wiping cloth (lint free) Ratchet and sockets Socket head wrenches Indicator with magnetic base Screwdrivers Hammer Horses (wood topped) Micrometer outside 0''-1'' Depth micrometer Wire	Lock out main switch Remove oil motor drive, driving coupling from screw, table end brackets Secure ball nut on ball screw (wire, cloth) Remove ball nut bolts from table, assembly of screw and ball nuts, and bolts from nut halves and remove dowels Move slightly to remove spacer Grind spacer to desired thickness Reinstall spacer, dowles and bolts Use dial indicator to verify looseness Remove all looseness by regrinding spacer; reinstall screw assembly and end brackets Remove one bearing thrust plate and grind to desired length; reinstall and check for end play of screws Reinstall oil motor Manually operate automatic lubricator Check for operation	Safety glasses Slips from oil spills Handle assembly carefully Secure ball nut or it will windmill (mashed fingers) No rings Clean, lint-free wiping cloth Smoking not permitted where flammable liquids and paint are being used/stored or posted Report all injuries

DECISIONS	CUES	ERRORS
Determine adjustment Loose ball screw	Condition and life span of parts	Wear from usage

(TASK STATEMENT) REPAIR BALL SCREW LOOSENESS

SCIENCE	MATH – NUMBER SYSTEMS
Work input, work output, friction and efficiency in simple machines Effect of heating and cooling on expansion of materials [heat, change of dimensions] Fluids under pressure [oil under pressure] Composition of matter, including protons, neutrons, electrons, atoms, molecules, elements [hardness] Transfer of energy from one form to another [from oil pressure to linear measurement] Inertia and momentum Effects of friction on work processes and product quality Arrangement of molecules, atoms and ions and the effect on structure and strength of materials [structure rearrangement] Resistance of materials to change in shape Effects of lubrication	Measures of length [decimal] Wrench dimensions Operating dimension

COMMUNICATIONS

PERFORMANCE MODES	EXAMPLES	SKILLS/CONCEPTS
Reading	Repair service order	Comprehension, detail/inference, trade terminology
	Parts and repair manual	Description of mechanism, definition, instructions
Speaking	Instructions to operator	Trade terminology, enunciation, clarity of expression, logic
Writing	Requisition of parts	Penmanship, spelling, classification, terminology
Viewing	Equipment	Visual analysis, describing, logic, detail/inference

(TASK STATEMENT) MAINTAIN BALL SCREW

TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON	PERFORMANCE KNOWLEDGE	SAFETY – HAZARD
Flashlight Wiping cloth (lint free) Ratchet wrench and sockets Socket head wrenches	Lock out main switch Wipe screw clean Adjust lubricator Tighten ball nut mounting screws Tighten end plate mounting screws	Safety glasses Slips on oil spills Clean lint free wiping cloth [Smoking not permitted where flammable liquids and paint are being used/stored or posted] [Report all injuries]

DECISIONS	CUES	ERRORS
Determine maintenance services to perform	Standard preventative maintenance schedule	Machine failure under load

291

(TASK STATEMENT) MAINTAIN BALL SCREW

SCIENCE	MATH – NUMBER SYSTEMS
Work input, work output, friction and efficiency in simple machines Effect of heating and cooling on expansion of materials [change of dimensions] Liquids under pressure [oil under pressure] Composition of matter, including protrons, neutrons, electrons, atoms, molecules, elements Transfer of energy from one form to another **Inertia and momentum** Effects of friction on work processes and product quality Resistance of materials to change in shape	Wrench dimensions Operating dimensions

COMMUNICATIONS		
PERFORMANCE MODES	EXAMPLES	SKILLS/CONCEPTS
Reading	Preventative maintenance schedule	Comprehension, detail/inference, description of mechanism, trade terminology
Speaking	Instructions to operator	Trade terminology, enunciation, clarity of expression, logic
Viewing	Equipment	Visual analysis, describing, logic, detail/inference

Duty N Inspecting, Repairing, and Maintaining Fluid Feed Screw

1 Inspect fluid feed screw (oil cylinder)
2 Repair fluid feed screw oil cylinder (milling machine)
3 Maintain fluid feed screw (oil cylinder) milling machine

(TASK STATEMENT) **INSPECT FLUID FEED SCREW (OIL CYLINDER)**

TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON	PERFORMANCE KNOWLEDGE	SAFETY – HAZAR
Wiping cloth Flashlight Ratchet wrench and sockets Socked head wrenches (Allen)	Remove both aprons Operate table from end to end Inspect for leaks Inspect piston rod for scores and nicks Inspect hold down bolts	Safety glasses [Smoking not permitted where flammable liquids and paint are being used/stored or posted] [Report all injuries]
DECISIONS	**CUES**	**ERRORS**
Determine repairs needed	Condition of equipment, leaks, scores, nicks	Machine failure under load

(TASK STATEMENT) INSPECT FLUID FEED SCREW (OIL CYLINDER)

SCIENCE	MATH – NUMBER SYSTEMS
Work input, work output, friction and efficiency in simple machines Fluids under pressure Forces acting on a body immersed or floating in a liquid Transfer of energy from one form to another Inertia and momentum [Pascals Law] Effects of lubricants	Wrench dimensions Operating dimensions

COMMUNICATIONS

PERFORMANCE MODES	EXAMPLES	SKILLS/CONCEPTS
Reading	Inspection order	Comprehension, detail/inference, trade terminology
Speaking	Instruction to operator	Trade terminology, enunciation, clarity of expression, logic
Viewing	Inspect equipment	Visual analysis, describing, logic, detail/inference
Listening	Operating equipment	Auditory discrimination, concentration, noise discrimination
Touching	Surface and parts	Shape, texture, movement, tension

104

(TASK STATEMENT) REPAIR FLUID FEED SCREW OIL CYLINDER (MILLING MACHINE)

105

TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON	PERFORMANCE KNOWLEDGE	SAFETY – HAZARD
Socket head wrenches End wrenches Tubing box wrench **Screwdrivers** Wiping cloths Spedi-dri Flashlight Cylinder rod seal	Remove table apron - rod end Move table to expose piston rod and cylinder end Lock out main switch Unbolt piston rod from bracket on frame **Loosen fitting on hydro line on opposite end of cylinder** Push piston rod clear of bracket Remove seal gland and oil seal Install new seal Reinstall gland **Reinstall piston rod in end bracket** **Tighten loosened oil line fitting** Start machine Operate machine end to end Blead air from cylinder - both ends Start machine check for operation, leaks Reinstall table apron	Safety glasses Caution - working on moving machinery Slips from oil spills or leaks Do not attempt to take dimensions while machine is in motion When using knives, screwdrivers or any cutting tool do not direct the strain toward self or another employee Do not use screwdrivers as chisels or pry bars [Smoking not permitted where flammable liquids and paint are being used/stored or posted] [Report all injuries]

DECISIONS	CUES	ERRORS
Determine whether to install new seal	Condition and lifespan of parts	Constant usage Leakage Machine failure under load

(TASK STATEMENT) REPAIR FLUID FEED SCREW OIL CYLINDER (MILLING MACHINE)

SCIENCE	MATH – NUMBER SYSTEMS
Work input, work output, friction and efficiency in simple machines Fluids under pressure Forces acting on a body immersed or floating in a liquid Transfer of energy from one form to another Inertia and momentum Pascal's Law Effects of lubricants	Wrench dimensions Number of oil seal Operating dimensions

COMMUNICATIONS

PERFORMANCE MODES	EXAMPLES	SKILLS/CONCEPTS
Reading	Repair service order	Comprehension, detail/inference, trade terminology
	Parts and repair manuals	Description of mechanism, definition, instructions
Speaking	Instructions to operator	Trade terminology, enunciation, clarity of expression, logic
Writing	Requisition for parts	Penmanship, spelling, classification, terminology
Viewing	Equipment	Visual analysis, describing, logic, detail/inference

(TASK STATEMENT) MAINTAIN FLUID FEED SCREW (OIL CYLINDER) MILLING MACHINE

TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON	PERFORMANCE KNOWLEDGE	SAFETY – HAZARD
Socket head wrenches Ratchet wrench and sockets Flashlight Wiping cloth	Operate table end to end Remove apron on both ends Observe for leakage Stop leaks Tighten hold down bolts Reinstall aprons	Safety glasses [Smoking not permitted where flammable liquids and paint are being used/stored or posted] [Report all injuries]
DECISIONS	**CUES**	**ERRORS**
Determine maintenance service to perform	Standard preventative maintenance schedule	Machine failure under load

L01

(TASK STATEMENT) **MAINTAIN FLUID FEED SCREW** (OIL CYLINDER) MILLING MACHINE

SCIENCE	MATH – NUMBER SYSTEMS
Work input, work output, friction and efficiency in simple machines Fluids under pressure Forces acting on a body immersed or floating in a liquid Transfer of energy from one form to another Inertia and momentum Pascal's Law Effects of lubricant	Wrench dimensions Operating dimensions

COMMUNICATIONS

PERFORMANCE MODES	EXAMPLES	SKILLS/CONCEPTS
Reading	Preventative maintenance schedule	Comprehension, detail/inference, description of mechanism, trade terminology
Speaking	Instructions to operator	Trade terminology, enunciation, clarity of expression, logic
Viewing	Equipment	Visual analysis, describing, logic, detail/inference

Duty O Inspecting, Repairing, and Maintaining Anti Friction Bearings

1 Inspect anti friction bearing (roller or ball)
2 Repair anti friction bearing (roller or ball)
3 Maintain anti friction bearing (roller or ball)

(TASK STATEMENT) INSPECT ANTI-FRICTION BEARING (ROLLER OR BALL)

TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON	PERFORMANCE KNOWLEDGE	SAFETY – HAZARD
Flashlight Wiping cloth Contact thermometer Aligning bar (straight edge)	Inspect lubrication Check for excessive heat Check for excessive vibration Check for excessive noise	Safety glasses Grease on floor Caution: rotating shaft [Smoking not permitted where flammable liquids and paint are being used/stored or posted] [Report all injuries]

DECISIONS	CUES	ERRORS
Determine repairs needed	Condition of equipment, temperature, noise, vibration	Machine failure under load

(TASK STATEMENT) INSPECT ANIT-FRICTION BEARING (ROLLER OR BALL)

SCIENCE	MATH – NUMBER SYSTEMS
Simple machines used to gain mechanical advantage [pulleys] Work input, work output, friction and efficiency in simple machines [friction] Effect of heating and cooling on expansion of materials Fluids under pressure [lube] Inertia and momentum Effects of friction on work processes and product quality Effects of lubrication	Basic math skills (read thermometer) Operating dimensions

COMMUNICATIONS

PERFORMANCE MODES	EXAMPLES	SKILLS/CONCEPTS
Reading	Inspection order	Comprehension, detail/inference, trade terminology
Speaking	Instructions to operator	Trade terminology, enunciation, clarity of expression, logic
Viewing	Inspect equipment	Visual analysis, describing, logic, detail/inference
Listening	Operating equipment	Auditory discrimination, concentration, noise discrimination
Touching	Surface and parts	Shape, texture, movement, tension

(TASK STATEMENT) REPAIR ANTI-FRICTION BEARING (ROLLER OR BALL)

112

TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON	PERFORMANCE KNOWLEDGE	SAFETY – HAZARD
Ratchet wrench and sockets Socket bead wrenches Flashlight Wiping cloth Stoddard solvent Jack Timber File Emory cloth Oil Surface thermometer	Lock out main switch Jack up bearing shaft and block Remove bearing Clean and inspect bearing for possible reuse Reinstall old bearing if possible to reuse Lower shaft, secure bearing mount Check and adjust alignment Lubricate Run and check operation Feel for heat Feel for vibrations Listen for unusual noise	Safety glasses Pinch points Splinters from timber (wear gloves) [Smoking not permitted where flammable liquids and paint are being used/stored or posted] [Report all injuries]

DECISIONS	CUES	ERRORS
Determine whether to reuse or replace bearing	Dirty, noisy, heat Lack of lube Life span of parts Expense of bearing	Machine failure under load Unnecessary expense

211

(TASK STATEMENT) REPAIR ANTI-FRICTION BEARING (ROLLER OR BALL)

SCIENCE	MATH – NUMBER SYSTEMS
Simple machines used to gain mechanical advantage [pulley] Work input, work output, friction and efficiency in simple machines Effect of heating and cooling on expansion of materials [expansion due to heat] Fluids under pressure [proper lube] Inertia and momentum Effects of friction on work processes and product quality Effects of lubrication	Wrench dimensions Measures of length Measures of temperature [bearings] Liquid and dry measures [oil] Operating dimensions

COMMUNICATIONS

PERFORMANCE MODES	EXAMPLES	SKILLS/CONCEPTS
Reading	Repair service order	Comprehension, detail/inference, trade terminology
	Parts and repair manual	Description of mechanism, definition, instructions
Speaking	Instructions to operator	Trade terminology, enunciation, clarity of expression, logic
Writing	Requisition for parts	Penmanship, spelling, classification, terminology
Viewing	Equipment	Visual analysis, describing, logic, detail/inference

(TASK STATEMENT) MAINTAIN ANIT-FRICTION BEARING (ROLLER OR BALL)

TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON	PERFORMANCE KNOWLEDGE	SAFETY – HAZARD
Flashlight Wiping cloth Lubricant Ratchet wrench and sockets Socket head wrenches	Lock out main switch Wip off exterior Lubricate bearing Loosen bearing bolts Align bearing Tighten mounting bolts Run and check	Safety glasses Grease on floor [Smoking not permitted where flammable liquids and paint are being used/stored or posted] [Report all injuries]

DECISIONS	CUES	ERRORS
Determine maintenance services to perform	Standard preventative maintenance schedule	Machine failure under load

(TASK STATEMENT) MAINTAIN ANTI-FRICTION BEARING (ROLLER OR BALL)

SCIENCE	MATH – NUMBER SYSTEMS
Simple machines used to gain mechanical advantage [pulley] Work input, work output, friction and efficiency in simple machines Effect of heating and cooling on expansion of material [expansion due to heat] Fluids under pressure [lube] Inertia and momentum Effects of friction on work processes and product quality Effects of lubricants	Wrench dimensions Operating dimensions

COMMUNICATIONS

PERFORMANCE MODES	EXAMPLES	SKILLS/CONCEPTS
Reading	Preventative maintenance schedule	Comprehension, detail/inference, description of mechanism, trade terminology
Speaking	Instructions to operator	Trade terminology, enunciation, clarity of expression, logic
Viewing	Equipment	Visual analysis, describing, logic, detail/inference

115

Duty P Inspecting, Repairing, and Maintaining Control Systems

1 Inspect control system (linkage and levers)
2 Repair control systems (linkage and levers)
3 Maintain control system (linkage and levers)

116

(TASK STATEMENT) INSPECT CONTROL SYSTEM LINKAGE AND LEVERS

TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON	PERFORMANCE KNOWLEDGE	SAFETY – HAZARD
Flashlight Wiping cloth	Shut off machine Hand operate levers Feel for looseness Visually inspect pins, levers for deformations (wear, twist, bends) Start machine Feel for looseness Listen for vibrations and rattles	Safety glasses [Smoking not permitted where flammable liquids and paint are being stored/used or posted] [Report all injuries]

DECISIONS	CUES	ERRORS
Determine repairs needed	Condition of equipment	Machine failure under load

(TASK STATEMENT) INSPECT CONTROL SYSTEM LINKAGE AND LEVERS

SCIENCE	MATH – NUMBER SYSTEMS
Simple machines used to gain mechanical advantage [levers and linkage] Effects of lubricants	Basic math skills Operating dimensions

COMMUNICATIONS

PERFORMANCE MODES	EXAMPLES	SKILLS/CONCEPTS
Reading	Inspection order	Comprehension, detail/inference, trade terminology
Speaking	Instructions to operator	Trade terminology, enunciation, clarity of expression, logic
Viewing	Inspect equipment	Visual analysis, describing, logic, detail/inference
Listening	Operating equipment	Auditory discrimination, concentration, noise discrimination
Touching	Surface and parts	Shape, texture, movement, tension

811

118

(TASK STATEMENT) REPAIR CONTROL SYSTEMS (LINKAGE AND LEVERS)

TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON	PERFORMANCE KNOWLEDGE	SAFETY – HAZARD
Flashlight Ratchet wrench and sockets Socket head wrenches Electric drill High speed drills Reamers (rose type) Pliers Ball peen hammer Oil can Oil Anvil or steel plate Cotter keys Oversize linkage pins	Lock out main switch Dismantle levers, pins, linkage, fork and bar shifter and pinions gears, and quadrant gear shifter Drill and ream levers and linkage Install oversized pins and cotter keys Straighten shifting levers Linkage and fork Replace sleeve bearings as required Check spring, de tent tooth and slot	Safety glasses Pinch points Report all injuries [Smoking not permitted where flammable liquids and paint are being used/ stored or posted] [Report all injuries]

DECISIONS	CUES	ERRORS
Determine whether to repair or place parts	Condition and lifespan of parts	Machine failure under load

(TASK STATEMENT) REPAIR CONTROL SYSTEMS (LINKAGE AND LEVERS)

SCIENCE	MATH – NUMBER SYSTEMS
Simple machines used to gain mechanical advantage [levers, linkage] Composition of matter, including protons. neutrons, electrons, atoms, molecules, elements Transfer of energy from one form to another [spring] Effects of friction on work processes and product quality [detent] Relationship of force to distortion in an elastic body [spring] Resistance of materials to change in shape [spring compression] Effects of lubricant	Basic math skills Wrench sizes dimensions Drill sizes Reamer sizes Operating dimensions

COMMUNICATIONS

PERFORMANCE MODES	EXAMPLES	SKILLS/CONCEPTS
Reading	Repair service order	Comprehension, detail/inference, trade terminology
	Parts and repair manual	Description of mechanism, definition, instructions
Speaking	Instructions to operator	Trade terminology, enunciation, clarity of expression, logic
Writing	Requisition for parts	Penmanship, spelling, classification, terminology
Viewing	Equipment	Visual analysis, describing, logic, detail/inference

120

(TASK STATEMENT) MAINTAIN CONTROL SYSTEM (LINKAGE AND LEVERS)

TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON	PERFORMANCE KNOWLEDGE	SAFETY – HAZARD 121
Flashlight Oil can Oil Wiping cloth	Shut off machine Lubricate linkage and pins Start machine and actuate lever in all positions Check for correct operation: linkage pins, cotter keys	Safety glasses Oil spills Slips and falls Pinch points [Smoking not permitted where flammable liquids and paint are being stored/used or posted] [Report all injuries]

121

DECISIONS	CUES	ERRORS
Determine maintenance services to perform	Standard preventative maintenance schedule	Machine failure under load

(TASK STATEMENT) MAINTAIN CONTROL SYSTEM (LINKAGE AND LEVERS)

SCIENCE	MATH – NUMBER SYSTEMS
Simple machines used to gain mechanical advantage [levers and linkage] Composition of matter, including protons, neutrons, electrons, atoms, molecules, elements [hardness] Effects of lubricants	Basic math skills Operating dimensions

COMMUNICATIONS

PERFORMANCE MODES	EXAMPLES	SKILLS/CONCEPTS
Reading	Preventative maintenance schedule	Comprehension, detail/inference, description of mechanism, trade terminology
Speaking	Instructions to operator	Trade terminology, enunciation, clarity of expression, logic
Viewing	Equipment	Visual analysis, describing, logic, detail/inference

122

Duty Q Inspecting, Repairing, and Maintaining Hydraulic, Pneumatic, and Vacuum Components and Systems

1 Inspect hydraulic, pneumatic, vacuum components and systems
2 Repair hydraulic, pneumatic, vacuum components and systems
3 Maintain hydraulic, pneumatic, vacuum components and systems

123

123

(TASK STATEMENT) INSPECT HYDRAULIC, PNEUMATIC, VACUUM COMPONENTS AND SYSTEMS

TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON	PERFORMANCE KNOWLEDGE	SAFETY – HAZARD
Flashlight Wiping cloth Fox boro recorder	Operate system, at full capacity Inspect flow and pressures Inspect for leaks Inspect hose for wear Inspect safety cables on high pressure hoses and lines Inspect all fittings Inspect drive belts Inspect pulleys for wear Inspect lubricants Inspect for smooth operation Hand check for vibration Check hold down bolts Check hour meters time factor Listen for unusual noise Check vacuum systems	Safety glasses [Smoking not permitted where flammable liquids and paint are being stored/used or posted] [Report all injuries]

DECISIONS	CUES	ERRORS
Determine repairs needed	Condition of equipment	Machine failure under load

(TASK STATEMENT) INSPECT HYDRAULIC, PNEUMATIC, VACUUM COMPONENTS AND SYSTEMS

SCIENCE	MATH – NUMBER SYSTEMS
Simple machines used to gain mechanical advantage [gears pulleys] Conversion of pressure of fluids and gases to linear or rotary motions Effects of lubricants	Basic math skills Operating dimensions

COMMUNICATIONS

PERFORMANCE MODES	EXAMPLES	SKILLS/CONCEPTS
Reading	Inspection order	Comprehension, detail/inference, trade terminology
Speaking	Instructions to operator	Trade terminology, enunciation, clarity of expression, logic
Viewing	Inspection of equipment	Visual analysis, describing, logic, detail/inference
Listening	Operating equipment	Auditory descrimination, concentration, noise discrimination
Touching	Surface and parts	Shape, texture, movement, tension

125

(TASK STATEMENT) REPAIR HYDRAULIC, PNEUMATIC, VACUUM COMPONENTS AND SYSTEMS

TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON	PERFORMANCE KNOWLEDGE	SAFETY – HAZARD 126
Test gauges (master) Flow meter Miss hardware (pipe fittings, etc.) Filter elements O-rings Ratchet wrench set Socket head wrench set End wrench set Screwdrivers Ball peen hammer Tube cutter Hack saw Putty knife Stoddard solvent Wiping cloths Emergy cloth Sealant Taper pin Oil can and oil Fox boro recorder Air hose and blow gun	Lock out main switch Remove cover plate from reservoir Clean interior; clean and/or replace filter; check and replace as required: all tubing, piping and fittings Replace cover Remove and dismantle valves; replace defective parts; reassemble and install valves Remove pump and disassemble; replace defective parts; reassemble and install Calibrate pressure gauges Refill lubrication system and hydraulic system, if required; bleed air from hydraulic lines; run system and check flow and pressures; visually check accumulators, actuators, seals, safety controls, receivers, mufflers, fans fittings, drive and general conditions Blow out heat exchanger and check system	Safety glasses Pinch points Oil spills Caution: high pressure on air and oil lines Smoking not permitted where flammable liquids and paint are being used/stored or posted Report all injuries

DECISIONS	CUES	ERRORS
Determine whether to repair or replace defective parts	Hour meter, dust, dirt, normal wear, leaks	Machine failure under load

126

(TASK STATEMENT) REPAIR HYDRAULIC, PNEUMATIC, VACUUM COMPONENTS AND SYSTEM

SCIENCE	MATH – NUMBER SYSTEMS
Simple machines used to gain mechanical advantage [levers, gears, pulleys] Work input, work output, friction and efficiency in simple machines Fluids under pressure Transfer of energy from one form to another Transfer of heat from one body to another Inertia and momentum Effects of friction on work processes and product quality Effects of lubricants	Basic math skills Wrench dimensions Operating dimensions

127

COMMUNICATIONS

PERFORMANCE MODES	EXAMPLES	SKILLS/CONCEPTS
Reading	Repair service order	Comprehension, detail/inference, trade terminology
	Parts and repair manual	Description of mechanism, definition, instructions
Speaking	Instructions to operator	Trade terminology, enunciation, clarity of expression, logic
Writing	Requisition of parts	Penmanship, spelling, classification, terminology
Viewing	Equipment	Visual analysis, describing, logic, detail/inference

127

(TASK STATEMENT) MAINTAIN HYDRAULIC, PNEUMATIC, VACUUM COMPONENTS AND SYSTEMS

TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON	PERFORMANCE KNOWLEDGE	SAFETY – HAZARD
Flashlight Wiping cloth End wrenches Hydraulic oil Lube oil Grease gun Fox boro recorder Test gauges (master)	Lock out main switch Remove, clean or replace external filter Check belt drives Adjust tension Lube variable belt adjustments Check all fittings Check all hose Tighten as required **Check pressure gauges, correct errors** **Check flows, correct errors** **Check all valves, replace packing** **Check oil for viscosity** **Check oil for contaminents** Refill hydraulic oil if required Check vacuum for leaks Bleed air from hydraulic system	Safety glasses Pinch points [Smoking not permitted where flammable liquids and paint are being used/stored or posted] [Report all injuries]

DECISIONS	CUES	ERRORS
Determine maintenance service to perform	Standard preventative maintenance	Machine failure under load

(TASK STATEMENT) MAINTAIN HYDRAULIC, PNEUMATIC, VACUUM COMPONENTS AND SYSTEMS

SCIENCE	MATH – NUMBER SYSTEMS
Simple machines used to gain mechanical advantage [levers, gears, pulleys and belts] Work input, machines Effect of heating and cooling on expansion of materials Fluids under pressure [transfer of pressure] Transfer of energy from one form to another [gas under pressure] Inertia and momentum Effects of friction on work processes and product quality Relationship of force to distortion in an elastic body [packing and O-rings] Resistance of materials to change in shape Effects of lubricants	Basic math skills Operating dimensions

COMMUNICATIONS

PERFORMANCE MODES	EXAMPLES	SKILLS/CONCEPTS
Reading	Preventative maintenance schedule	Comprehension, detail/inference, description of mechanism, trade terminology
Speaking	Instructions to operator	Trade terminology, enunciation, clarity of expression, logic
Viewing	Equipment	Visual analysis, describing, logic, detail/inference

Duty R Inspecting, Repairing, and Maintaining Installation Machinery

1 Install machinery

(TASK STATEMENT) INSTALL MACHINERY

TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON	PERFORMANCE KNOWLEDGE	SAFETY – HAZARD
Thermometer (contact) Levels (spirit) Plumb bobs Bronson or Wild optical transit Snips Shim stock Stoddard solvent Wiping cloth Putty knife	Uncrate machine, assist setting on foundation; clean exterior Level machine with spirit level and/or optical transit Cut shim stock Tighten hold down bolts Recheck for level, adjust accordingly Lubricate machine; check all movements and for missing parts (bill of lading) Adjust tension on drive belts Start machine, run four hours at me medium speed Check bearings for heat, gear box oil, for all tools, for parts manual, for operators manual, and for smooth operating conditions Operate at speeds and feeds Check all trips and stop dogs, automatic movement reversals and automatic lubers Check for safety features	Safety glasses Smoking not permitted where flammable liquids and paint are being used/stored or posted Report all injuries
DECISIONS	**CUES**	**ERRORS**
Determine adjustments needed	Operation of machinery	Machine failure under load

(TASK STATEMENT) INSTALL MACHINERY

SCIENCE	MATH – NUMBER SYSTEMS
Simple machines used to gain mechanical advantage [gear, levers] Work input, work output, friction and efficiency in simple machines Effects of heating and cooling on expansion of materials Fluids under pressure Effects of lubricants	Operating dimensions

COMMUNICATIONS

PERFORMANCE MODES	EXAMPLES	SKILLS/CONCEPTS
Reading	Installation order	Comprehension, detail/inference, trade terminology
	Parts and operators manual	Description of mechanism, definition, instructions
Speaking	Instructions to operator	Trade terminology, enunciation, clarity of expression, logic
Viewing	Inspect equipment	Visual analysis, describing, logic, detail/inference
Listening	Operating equipment	Auditory discrimination, concentration noise discrimination
Touching	Surface and parts	Shape, texture, movement, tension

Duty S Inspecting, Repairing, and Maintaining Service Bearings

1 Replace bearing (sleeve)

133

(TASK STATEMENT) REPLACE BEARING (SLEEVE)

TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON	PERFORMANCE KNOWLEDGE	SAFETY – HAZARD
Scrapers Oil stone Hi-spot prussian blue Oil Timber Ratchet wrench Wiping cloth	Secure drive mechanism Loosen bolts in bearing block Raise shaft slightly Remove bearing block Remove sleeve from block Place prussian blue on shaft Slide new bearing on shaft Lower shaft Rotate shaft Remove bearing and scrape, clean shaft Clean bearing Lube shaft and bearings Reassemble Run and check	Safety glasses Caution - sharp tools Pinch points Do not use cotton waste or dirty cloths to wipe bearings Do not use incorrect kind of lubricant [Smoking not permitted where flammable liquids and paint are being used/stored or posted] [Report all injuries]

DECISIONS	CUES	ERRORS
Determine whether to repair or replace bad bearing	Excess oil leakage Looseness Vibration	Machine failure under load

(TASK STATEMENT) REPLACE BEARING (SLEEVE)

SCIENCE	MATH – NUMBER SYSTEMS
Lubricant Sae-Numbers and meanings Transfer of heat from one body to another Effects of friction on work processes and product quality Effects of lubricants	Measures of length [length ID and OD] Operating dimensions

COMMUNICATIONS

PERFORMANCE MODES	EXAMPLES	SKILLS/CONCEPTS
Reading	Repair service order	Comprehension, detail/inference, trade terminology
	Parts and repair manual	Description of mechanism, definition, instructions
Writing	Requisition of parts	Penmanship, spelling, classification, terminology
Viewing	Equipment	Visual analysis, describing, logic detail/inference

135

Duty T Inspecting, Repairing, and Maintaining Weld Shaft Padding

1 Weld-build up shaft by padding

136

(TASK STATEMENT) WELD-BUILD UP SHAFT BY PADDING

TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON	PERFORMANCE KNOWLEDGE	SAFETY – HAZARD
Arc welder Helmet Electrodes Chipping hammer Wire brush Vee blocks	Clean shaft Position shaft on vee blocks Acquire type of metal of shaft Acquire correct electrode Set proper amperage Weld in proper sequence Chip slag and brush each bead of weld Overlap each bead 1/3 Check porosity, visually inspect Etch with dilute solution of nitric acid Machine welded sections back to original dimensions	Safety glasses Leather gloves Protective clothing Always pour acid into water Keep welding stubs off floor Check for flammable material before welding Have water type extinguisher Curtain to protect others from arc rays Faceshield, rubber gloves and apron when handling acid [Smoking not permitted where flammable liquids and paint are being used/stored or posted]

DECISIONS	CUES	ERRORS
Determine if surface is worn	Frozen bearing	Machine failure

(TASK STATEMENT) WELD-BUILD UP SHAFT BY PADDING

SCIENCE	MATH – NUMBER SYSTEMS
Effect of heating and cooling on expansion of material Transfer of heat from one body to another Effects of friction on work processes and product quality Composition of matter,including protons, neutrons, electrons, atoms, molecules, elements Electrode: tensile strength, yield point, elongation, melt off rate Cohesion Adhesion	Measurement of length Read and interpret charts, tables, and/or graphs [charts for amperage settings] Operating dimensions

COMMUNICATIONS

PERFORMANCE MODES	EXAMPLES	SKILLS/CONCEPTS
Reading	Repair service order	Comprehension, detail/inference, trade terminology
	Parts and repair manual	Description of mechanism,definition, instructions
Writing	Requisition for parts	Penmanship, spelling, classification, terminology
Viewing	Equipment	Visual analysis, describing, logic, detail/inference

138

Duty U Inspecting, Repairing, and Maintaining Harden Solder

1 Sharpen drill
2 Silver solder joint

(TASK STATEMENT) SHARPEN DRILL

TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON	PERFORMANCE KNOWLEDGE	SAFETY – HAZARD
Grinding wheel (water cooled) Drill grinding gage Stone dresser Goggles	Dress face of stone Readjust tool rest Lip clearance 8° to 12° High speed drill High carbon Carbide tip	Safety glasses Disconnect power supply when changing grinding wheels Stand to one side when dressing grinding wheel Never ''dig'' into the side of a grinding wheel. It will throw wheel out of balance Tool rests to be adjusted to 1/8 inch or less from face of stone [Smoking not permitted where flammable liquids and paint are being used/stored or posted] [Report all injuries]

DECISIONS	CUES	ERRORS
Determine if the drill is dull	Length and angle of tips Dull cutting edge	No lubricant and/or coolant Drill failure

(TASK STATEMENT) SHARPEN DRILL

SCIENCE	MATH – NUMBER SYSTEMS
Effect of friction on work processes and product quality Arrangement of molecules, atoms and ions and the effect on structure and strength of materials Motion resulting from two or more forces acting on a point in a body [motion] Composition of stone Use of coolant to absorb heat during grinding	Index drill calibration Operating dimensions

COMMUNICATIONS

PERFORMANCE MODES	EXAMPLES	SKILLS/CONCEPTS
Viewing	drill	Visual analysis, describing, logic, detail/inference, recognize symbol codes and emblems

(TASK STATEMENT) SILVER SOLDER JOINT

TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON	PERFORMANCE KNOWLEDGE	SAFETY – HAZARD
Emory cloth Silver solder Flux Oxy-acetylene torch Goggles Flint lighter File Deburrer Copper tubing Copper elbow Pliers Hack saw Fire extinguisher	**Clean surface** Check silver content of solder Identify correct flux Adjust proper flame on torch Melting point of solder **Melting point of copper**	Safety glasses Goggles Gloves Report all injuries to your foreman Check fire extinguisher Dispose of scrap material in scrap hopper All files must have handles Check for flammable material Never use cigarette or match to light torch Relieve pressure on pipe before starting job Empty pipe <u>completely</u> before soldering [Smoking not permitted where flammable liquids and paint are being used/stored or posted] [Report all injuries]

DECISIONS	CUES	ERRORS
Determine whether to use silver solder or soft solder	Vibration factor	Weld does not hold

(TASK STATEMENT) SILVER SOLDER JOINT

SCIENCE	MATH – NUMBER SYSTEMS
Effects of heating and cooling on expansion of material Transfer of heat from one body to another Arrangement of molecules, atoms, ions and the effect on structure and strength of materials Theory of attraction of unlike metals Cohesion Adhesion	Measures of length, OD and ID

COMMUNICATIONS

PERFORMANCE MODES	EXAMPLES	SKILLS/CONCEPTS
Reading	Repair service order	Comprehension, detail/inference, trade terminology
	Parts and repair manual	Description of mechanism, definition, instruction
Writing	Requisition for parts	Penmanship, spelling, classification, terminology
Viewing	Equipment	Visual analysis, describing, logic, detail/inference

Duty V Inspecting, Repairing, and Maintaining Bending Pipe

1 Wrinkle bend pipe to 90°

(TASK STATEMENT) WRINKLE BEND PIPE TO 90°

TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON	PERFORMANCE KNOWLEDGE	SAFETY – HAZARD
Pipe Oxy-acetylene torch Goggles Flint lighter Rule Soap stone Large vise Chalk line Framing square Fire extinguisher	Layout Adjust torch Observe critical temperature Apply bending force Time heat belts Check for accuracy	Safety glasses Goggles Burns and radiation Gloves Fire extinguisher Check area for flammable material Never use cigarette or match to light torch [Smoking not permitted where flammable liquids and paint are being used/stored or posted] [Report all injuries]

DECISIONS	CUES	ERRORS
Determine size of pipe Determine radius size	Type of machinery	Inaccurate measurement

(TASK STATEMENT) WRINKLE BEND PIPE TO 90°

SCIENCE	MATH – NUMBER SYSTEMS
Fffects of heating and cooling on expansion of material Resistance of materials to change in shape [bending] Melting point of liquid oxygen Acetone Conditions of metals-stages: Alpha, Beta, Gamma and Delta Composition of metals Effects of heat on metals Hardening or annealing Elongation and/or expansion of metals per degree of heat	Measure of length [measurements] Use of arcs or chord in determining facts about a circle or its parts Determination of facts involving sectors of a circle Determination of facts involving lines tangent to circles Operating dimensions

941

COMMUNICATIONS

PERFORMANCE MODES	EXAMPLES	SKILLS/CONCEPTS
Reading	Repair service order	Comprehension, detail/inference, trade terminology
	Parts and repair manual	Description of mechanism, definition, instructions
Writing	Requisition for parts	Penmanship, spelling, classification, terminology
Viewing	Equipment	Visual analysis, describing, logic, detail/inference

INDEX 1

INDUSTRIAL MECHANICS RESPONSIBILITIES

1 wear eye protection
2 arrive promptly on service call
3 contact operator, have machine shut off and secured
4 have operator explain problem as seen
5 before attempting work - pull master switch off and secure switch
6 attempt to acertain repairs required
7 lay plan of action
8 make repairs
9 reverse procedings 3 and 5
10 have operator accept as OK
11 return to maintenance for new assignment

INDEX 2

FREQUENCY OF SOME PREVENTATIVE MAINTENANCE PROCEDURES

1 adjust belts,clean and inspect ---½ year
2 check feed screws and adjust as required ---1 year
3 adjust auto lubers ---1 year
4 check sight glass oil levers (operator) ---daily
5 lube non-shielded motor ball bearings ---½ year
6 check vibration amplitude all electric motors ---1 year
7 adjust gibs and examine all machines except the gibs on grinders ---½ year
8 adjust gibs and examine on grinders ----½ year
9 deburr machine ways ---1 year

INDEX 3
EMPLOYEES PERSONAL TOOLS

1 crescent wrench 6 inch
1 crescent wrench 10 inch
1 crescent wrench 3 inch
1 small proxyln hammer 10 inch handle
1 standard small ball peen hammer 10 inch handle
1 standard medium ball peen hammer 14 inch handle
1 standard set ¼ inch drive English socket wrenches
1 standard set ½ inch drive English socket wrenches
4 standard set pin punches
4 standard set center punches
4 standard set steel cut chisels
6 standard set screwdrivers
1 standard adjustable hack saw
1 set open end wrenches to 1 inch
1 set box end wrenches to 1 inch
1 standard small pliers
1 standard medium pliers
1 standard large pliers
2 channel lock pliers 6½ inch-9½ inch
1 standard scriber
1 standard combination square (Starret or equivalent)
1 standard 0-1 inch outside micrometer (Starret or equivalent)
standard 1-2 inch outside micrometer (Starret or equivalent)
1 standard 0-3 inch depth micrometer (Starret or equivalent)
1 standard good pocket knife
1 standard set phillips drive screwdrivers
1 standard needle nose pliers small
1 standard needle nose pliers medium

1 set socket head wrenches to ¾ inch (Allen type)
1 persuader ½ inch galvanized pipe 10 inch long
1 pair 6½ inch vise grips
1 pair 9½ inch vise grips
1 outside caliper 4 inch
1 inside caliper 4 inch
1 divider caliper 4 inch
1 rubber mallet
1 scale 6 inch
1 burring tool
1 set jewelers screwdrivers
1 magnifying glass 3 inch
1 safety 2 cell flashlight
1 pipe wrench 10 inch
1 ice pick in sheath
3 pencils
1 tablet
1 dental type mirror
1 machine hand book latest edition
1 drill and tap size chart
1 straight edge ¼ x 1 x 24 inches
1 straight edge ¼ x 2 x 48 inches
1 small tool box
1 large tool box